# THE REFINER AND NATURAL GASOLINE MANUFACTURER

## In This Issue

Some characteristics of the hydrocarbons present in Mid-Continent kerosene. Experimental work indicates presence in kerosene fractions of only naphthene derivatives and certain naphthalenes.

Making lubricants by mixing vegetable oils with mineral oils. Process used by one concern for compounding products.

Getting the most out of Mexican crude is told in the second series appearing in this issue on this grade of oil which has caused the refiner so much trouble.

Converting compression gasoline plants into absorption plants. How one larger manufacturer made change.

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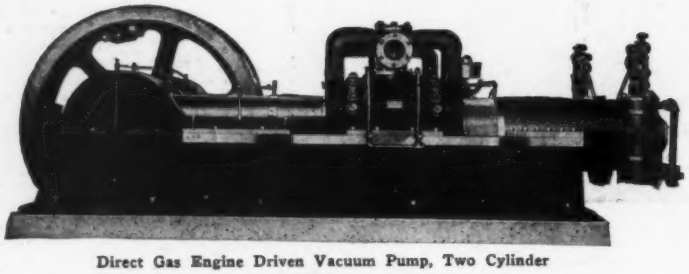

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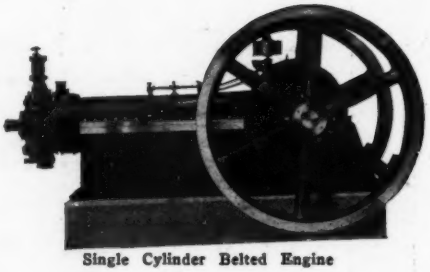

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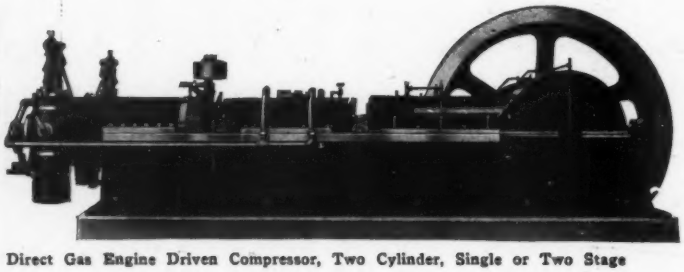

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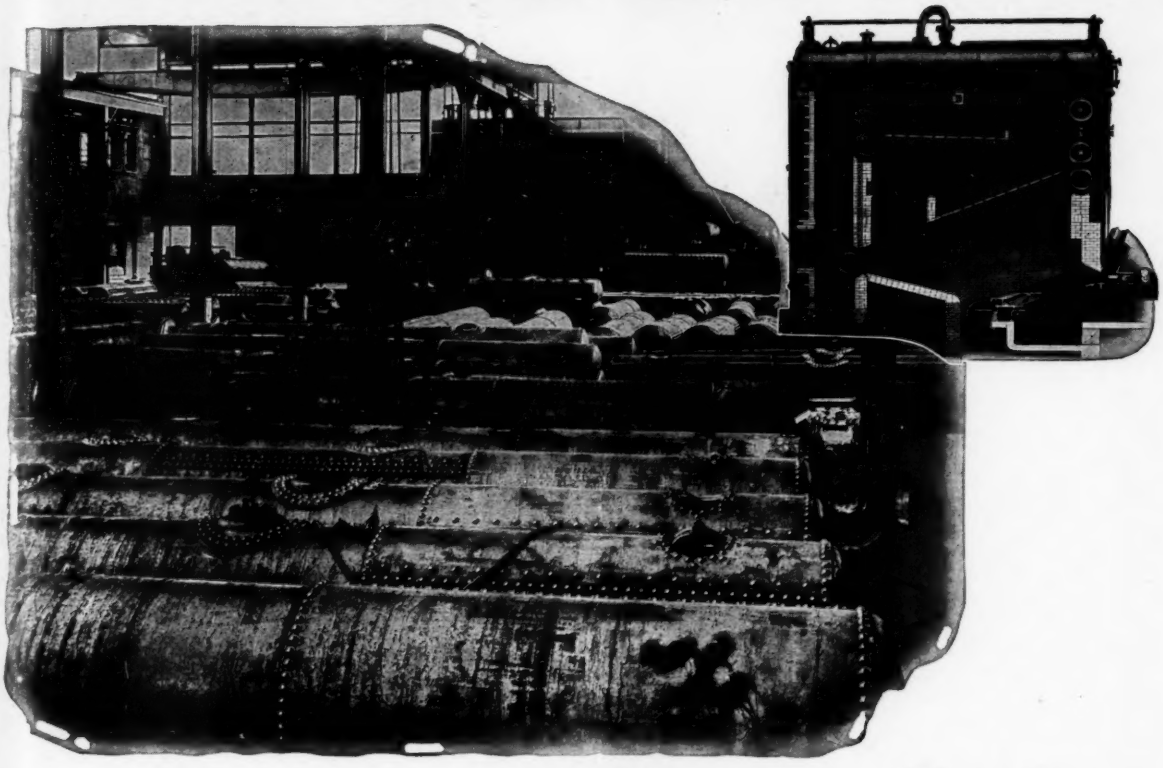

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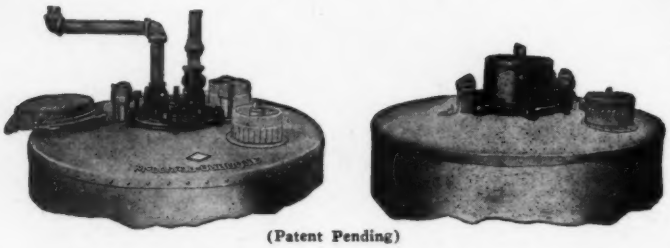

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All eight engines were started on September 14, 1922.

| Eng. No. | Days Continuous Run | Reason for Shutdown |
|---|---|---|
| 1 | 222 | General Adjustment |
| 2 | 236 | General Adjustment |
| 3 | 205 | Compressor Crosshead |
| 4 | 103 | Compressor Crosshead |
| 5 | 262 | Pipe Line Repair |
| 6 | 245 | Water Leak |
| 7 | 262 | Pipe Line Repair |
| 8 | 242 | Water Leak |

The two oldest engines have been operating for nine years in this station, where the gas demand is constant both summer and winter. No attempt was made to punish the engines in order to establish a record. It can be seen from the report that when the smallest adjustment was necessary, the engine was stopped and the adjustment made.

Too much honor can not be given to the man, W. J. Godfrey, whose unceasing energy in watching the small details about his station has made such a record possible. Yet he says: "No engine but a Cooper could last on a job like ours."

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R. L. DUDLEY..Manager and Editor

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# Not Too Optimistic

That refiners are optimistic is proven by the fact that there are still some in the business. After passing through 1923, we believe that it will be agreed that without optimism there would now be little left of the refining industry.

New years always seem bright, and certainly looking toward the rising sun of 1924 is pleasant after the dark period of the year that is past.

But it should be remembered that when 1923 was young the outlook was almost as inviting as now. Last year an unprecedented winter had seen a consumption of gasoline which made the winter market strong, and the optimism of distributors led them to the foresight of loading their storage to capacity in anticipation of the summer demand. For some reason it was assumed generally that gasoline out of the refiners' hands was consumed gasoline, and when the season of real demand arrived it appeared that some of the winter "consumed" gasoline was in tanks.

At the time when the demand was expected to pick up and refinery runs were gauged to meet that demand, the distributor began drawing upon his hoarded supply. And then came the crude overproduction with the disasters which attended all the way from the well to the filling station.

There is not one associated in any remote way with the oil industry who is not pleased at the thought that the above are memories.

Again in 1924 we have the same optimism, but it is not too optimistic to believe that the present good feeling has a more substantial basis.

Certainly the demand for refined products has that element of health to give real firmness to the price—an upward trend which is lacking the speculator which so often means as rapid decline from the peak obtained. And still more assuring is the control which seems to have been fastened upon the flood of crude oil. It is hardly possible that we will have a second year such as last in that respect. Rather than too much oil, it can easily be forecast now that if the refiner is annoyed by the crude situation in 1924 it will be from the fact that crude is not to be had even with the inducement of premium prices which are already in evidence in numerous instances.

But let us hope that the experience of the last few months will remain so green in our memories that the optimism of the new season will not permit us to run away with ourselves. It is proper to make hay while the sun shines, certainly, but it is not wise to cut more hay than can be gotten to cover before a rain.

So long as the demand is greater than the supply in sight, so long will the price favor the producer and manufacturer. Last year is an example of the opposite. With the statistics now available to the refining industry through the several agencies which deal with these matters, it should be an easy matter to so control the output of refined products as to keep the present optimism alive at least through the present year.

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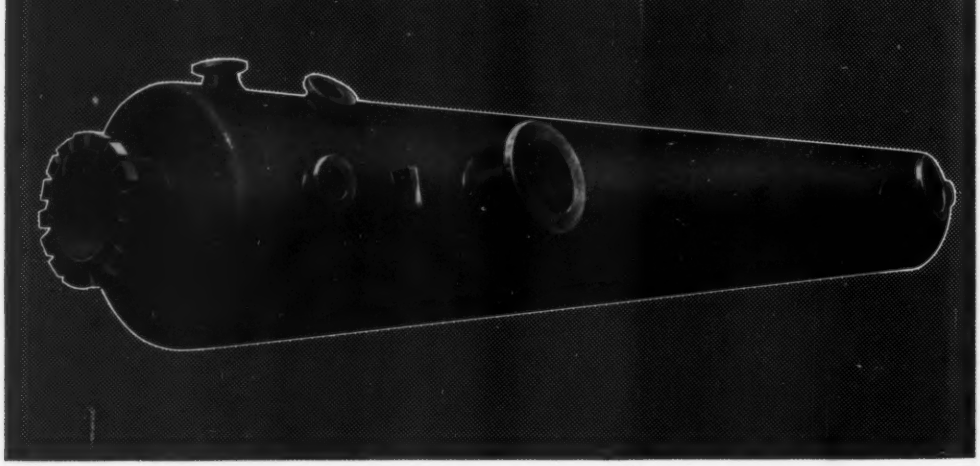

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# Some Characteristics of the Hydrocarbons Present in Mid-Continent Kerosene

## Experimental work indicates presence in kerosene fractions of only naphthene derivatives and certain naphthalenes

*By C. R. Wagner**

IT IS a well recognized fact that Mid-Continent (Oklahoma) crude, even in the lower boiling point fractions, gives a product which is very different from products of the same boiling points produced from Pennsylvania crude. The automobile tourist who measures the value of gasoline solely by its Baume' gravity[1] can never be convinced that 58.0 gravity gasoline at St. Louis may have as good a distillation range as 62.0 gravity gasoline at Bradford, Pennsylvania. It is also very commonly said that this difference in gravity is due to an admixture of naphthene (cyclohexane) derivatives with paraffin hydrocarbons in the Oklahoma crude.

### Oklahoma Crude

It was thought worth while to make some tests to ascertain, if possible, the character of the hydrocarbons present in the Oklahoma crude. It had been noted frequently that it was very difficult by ordinary methods to secure a product which would be unattacked by 66° Be. sulfuric acid (93.19% $H_2SO_4$). This suggested the presence of aromatic compounds. Attempts to freeze out paraffin hydrocarbons from heavy gasoline and kerosene fractions were fruitless even at temperatures as low as —50° C. This caused considerable doubt as to the presence of compounds of this series in any but the lightest fractions of the petroleum. The method or Moore, Morrell & Egloff[2] was used in separating the constituents of a special naphtha of specific gravity 0.7527 (56.5 Be.). This naphtha, as well as all other oils investigated, were products made by topping methods which insure the presence only of compounds originally present in the crude oil.

This special naphtha had a boiling point range (Bureau of Mines method, Tech. Paper 214) of 100°-160° C. One thousand cubic centimeters were treated at —10° C. with liquid sulfur dioxide (in the ratio 2 parts oil: 1 part $SO_2$) and the $SO_2$ evaporated from the lower layer. After neutralizing with caustic soda and washing with water about 30 cubic centimeters of a slightly fluorescent oil were obtained which had a specific gravity of 0.8388 (37.2 Be.) and the same boiling point range as the original naphtha. This oil gave the formolite reaction (Holde - Examination of Hydrocarbon Oils, p. 38-40) for aromatic compounds and was readily attacked by nitric and sulfuric acids.

Before going further with the work qualitative tests were made on two other fractions, one of specific gravity 0.7927 (47.0 Be.) and with a boiling point range of 146°-210° C., the other of specific gravity 0.8132 (42.5 Be.) and with a boiling point range of 192°-240° C. With great surprise it was found that the quantity of $SO_2$ soluble constituents increased roughly in proportion to the increase in specific gravity and average boiling point. The specific gravity of these $SO_2$ soluble fractions also increased with the rise in boiling point. Because of the larger proportion of the $SO_2$ soluble compounds in the heavier cuts and because of the greater ease of securing a closely fractioned oil in considerable quantities it was decided to carry on the investigation with this heavy fraction.

Several treatments of one liter quantities gave percentages of $SO_2$ soluble oil ranging from 4.6 to 6.0, with an average of 5.4 per cent. The procedure followed was to agitate the oil vigorously with one-third its volume of liquid $SO_2$ at —10° C. or lower. After allowing to settle the lower layer was removed and a second treatment made in exactly the same manner as the first. Sometimes a third treatment was made when the second yielded an appreciable quantity of soluble oil. After evaporating off the $SO_2$ both the soluble oil and the insoluble oil were washed with large quantities of cold water, neutral-liquid which resisted all attempts to crystallize it. The product formed by action of concentrated nitric acid alone or in the presence of concentrated sulfuric acid was essentially the same, but the reaction with the concentrated nitric acid proceeded with explosive violence. It could only be controlled by keeping both acid and oil cooled by ice and salt, and adding the acid very slowly.

### Processed Sulfur

It was thought that the presence of these sulfur compounds might be the cause of this violent reaction, and attempts were made to remove them by fractional distillation, by distilling with mercury, mercuric oxide, copper oxide, metallic sodium and lead oxide. Finally fuming sulfuric acid was used, but none of these methods materially reduced the sulfur content.

Several gallons of a secially processed low sulfur oil were prepared in the hope that the $SO_2$ soluble fraction would be correspondingly low in sulfur. No attempt was made to determine the quantity of $SO_2$ soluble oil in the sample because the treatment which it had received made it certain that some of these fractions had been removed. When it was found that the $SO_2$ soluble oil was very low in sulfur, enough was treated to give about 2500 c. c. of the $SO_2$ soluble oil. This had a specific gravity of 0.941 (23.3 Be.) and a boiling point range of 198°-244° C.

This 2500 c. c. of soluble oil was subjected to repeated fractional distillation at 5 mm. pressure. (It had been discovered in the preliminary work that some decomposition and some polymerization occurred when these fractions were distilled at atmospheric pressure.) In this way four main fractions were accumulated. Table 1 gives the results of an analysis of these fractions. Molecular weights were determined by the ized with strong caustic and again washed with water. In every case the boiling points of the two fractions were unchanged. The specific gravity of the insoluble oil ranged from 0.8100 (43.2 Be.) to 0.8081 (43.6 Be.) and the specific gravity of the soluble oil from 0.0159 (23.0 Be.) to 0.9094 (24.1 Be.).

Where the sulfur in the original oil had been 0.046 per cent, the insoluble oil now contained 0.016 per cent and the soluble oil 0.54 per cent. This soluble oil nitrated very readily with dilute nitric acid at the temperature of the steam bath, forming a red viscous

**TABLE I**

**Analysis of $SO_2$ soluble fractions from Mid-Continent Crude**

| Fraction | Distillation range at 5mm. | Sp. Grav. | $N[^{20}_{D}]$ | Analysis C | Analysis H | Analysis S | Mol. Wt. | Formula Suggested | Calculated Analysis C | Calculated Analysis H | Calc. Mol. Wt. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| I | 71—82 | 0.8697 | 1.4925 | 88.71 | 11.15 | 0.045 | 168 | $C_{13}H_{18}$ | 88.88 | 11.12 | 162 |
| II | 82—93 | 0.8866 | ..... | 89.17 | 10.99 | 0.021 | 173 | $C_{13}H_{20}$ | 89.36 | 10.64 | 188 |
| III | 93—104 | 0.9117 | 1.5238 | 89.56 | 10.30 | 0.054 | 167 | $C_{13}H_{18}$ | 89.66 | 10.34 | 174 |
| IV | 104—115 | 0.9383 | 1.5448 | 90.27 | 9.49 | 0.062 | 177 | $C_{13}H_{18}$ | 90.32 | 9.68 | 186 |

**TABLE II**

**Analysis of $SO_2$ Insoluble Fractions from Mid-Continent Crude**

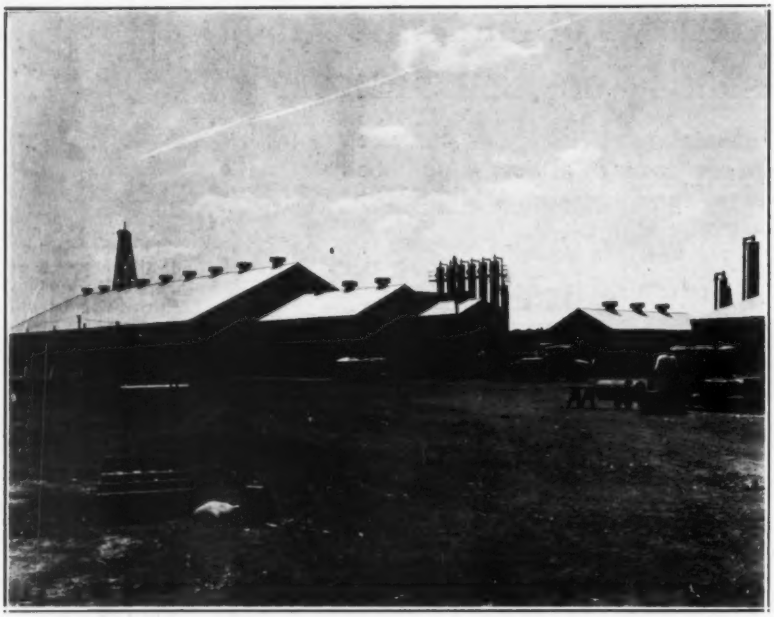
**ANALYSIS**

| Fraction | Distillation range at 5mm. | Spec. Grav. | $N[^{20}_{D}]$ | Analysis C | Analysis H | Analysis S | O (by dif.) | Mol. Wt. | Formula Suggested | Calc. Mol. Wt. |
|---|---|---|---|---|---|---|---|---|---|---|
| I | 71—82 | 0.8100 | | | | | | | | |
| II | 82—83 | 0.8109 | 1.4500 | 85.73 | 13.71 | 0.010 | 0.55 | 182 | $C_{13}H_{26}$ | 182 |
| III | 83—88 | 0.8118 | ..... | 85.38 | 14.09 | 0.011 | 0.52 | 179 | $C_{13}H_{26}$ | 182 |
| IV | 88—93 | 0.8123 | ..... | 85.27 | 13.85 | 0.012 | 0.87 | ... | ..... | ... |
| V | 93—95 | 0.8125 | ..... | 84.86 | 14.35 | 0.013 | 0.78 | 191 | $C_{14}H_{28}$ | 196 |
| VI | 95—103 | 0.8120 | 1.4517 | 85.46 | 14.21 | 0.010 | 0.32 | ... | ..... | ... |

*The accompanying paper was read by Mr. Wagner, who is manager of the Lion Oil Refining Company of El Dorado, Ark., before the American Chemical Society at Milwaukee. Printed by permission of Industrial and Engineering Chemistry.

[1]All gravities given in this paper, Baume or specific, were taken at 15.6/15.6° C.

[2]Chem. Met. Eng. 18, 396-408 (1918).



Roeser & Pendleton Gasoline Company's gasoline plant on the E. H. Shipley lease in Curry field, Stephens County, Texas

freezing point method, using recrystallized benzene.

These fractions were cooled down by a mixture of alcohol and $CO_2$ snow. Practically the entire fraction solidified within a range of 2° C. I—70°C. II—65° C. III—48° C. IV—28° C. Temperatures were taken by means of a toluene thermometer, and are not corrected. They are without doubt more accurate than the purity of the fractions.

Fraction II when nitrated gave as in other experiments a dark red, viscous liquid which could not be crystallized. (The reaction with concentrated acid was as violent as in preliminary experiments.) It was soluble in sodium hydroxide or sodium bicarbonate, being reprecipitated by acids. A nitrogen determination gave 9.55 per cent nitrogen, the calculated value for $C_{11}H_{15}(NO_2)_2$ being 10.05 per cent. Further nitration with fuming nitric acid caused little change in the appearance of the nitrated substance and added no more $NO_2$ radicals. Exposure to the air caused a gradual decomposition, evolving $NO_2$, and leaving a lustrous resin-like body. Traces of acid catalyzed this decomposition. An ether solution after being washed free of acid remained perfectly stable for months. An attempt was made to reduce some of this nitrated substance by hydrogen sulfide and by action of hydrochloric acid on granulated tin. No amines could be recovered from the tarry mass left after either reduction.

It is nearly impossible to get any data from the literature on compounds similar to those met with in this work. Their odor very closely resembles the naphthalene oil cut from coal tar and we believe them to be partly hydrogenated substituted naphthalenes. Their specific gravity, index of refraction, carbon-hydrogen ratio, and boiling points clearly eliminate the cyclohexane derivatives and the olefines. With the exception of fraction I the benzene derivatives are likewise eliminated. By searching through Beilstein, Engler-Hofer, Abegg and Chemical Abstracts only a few references were found to compounds similar to those suggested and the properties given for those are similar to the ones described here. No other class of compounds would include those studied in this work. If the author's assumptions were correct, I would be a substituted hexahydronaphthalene, II and III substituted tetrahydronaphthalenes, and IV a substituted dihydronaphthalene.

The $SO_2$ insoluble oil was also subjected to repeated fractional distillation under a pressure of 5mm. These cuts were practically unaffected by 66° Be. sulfuric acid, had a very pleasant odor and a low sulfur content. Table II gives the analysis of these fractions.

The index of refraction, as well as the analysis of these compounds, indicates that they belong to the $C_nH_{2n}$ series and that paraffin hydrocarbons are largely, if not entirely, absent. A further evidence of the absence of paraffin hydrocarbons is found in the melting points which were determined as described above. II —43° C. V —29° C. VI—29° C. Their inactivity toward sulfuric acid makes it nearly certain that they belong to the cyclohexane series.

The writer wishes to acknowledge his indebtedness to S. A. Montgomery and R. S. Lane for invaluable assistance rendered in this work, and to Leroy McMaster for use of laboratory and library facilities at Washington Univerity.

### Summary

Oils soluble in liquid $SO_2$ were isolated from Mid-Continent crude, ranging in boiling points from 100° C. to 250° C. and in specific gravity from 0.84 to 0.94. Considerable work was done on certain kerosene fractions and the evidence points strongly to the presence in this fraction of this crude oil of only naphthene derivatives with lesser amounts of partly hydrogenated substituted naphthalenes.

**Corsicana, Texas.**—The first natural gasoline plant to be erected in the Corsicana-Powell field has been placed in operation by the Humble Oil and Refining Company. Construction work on this plant was started late last summer when oil production in the field was nearing its peak. The absorption process was installed, and the plant is equipped to handle 5,000,000 cubic feet of gas daily, with a recovery running close to two gallons of gasoline per 1000 cubic feet.

Interior view of the engine room of Snowden & McSweeney natural gasoline plant on the J. C. Higginbotham lease in Stephens County, Texas, showing three Ingersoll-Rand compressors driven by Rathbun-Jones Natural Gas Engines

# Gasoline Manufacturers Ready for Big Year

## Rest and fasting cures "gas" tritis ailment of 1923 — "Weathering" process through

*By A. V. Bourque*
*Secretary Association of Natural Gasoline Manufacturers*

I HAVE been asked by the Refiner and Natural Gasoline Manufacturer to write an article about natural gasoline in 1923. There is not much to say—perhaps the least said the better, for it appears that the old adage of never speaking ill of those who have passed might well be applied to the year 1923.

### "Hyper-Gastritis"

In the final analysis the natural gasoline industry last year suffered from a severe attack of hyper-gastritis; high per cost of manufacture, and "gas"-tritis, an excess of gasoline.

The opening of 1923 looked for all the world like the beginning of other years in the industry. There was little demand, prices were low and it was a question of weathering the storm and in this connection I might state that weathering is a continual process with this industry. In summer we weather the product and in winter we weather the storm. Conditions were about the same as in previous years. But the advance in the crude market, together with the corresponding increase in the refined product made it appear that the natural gasoline industry was in for an unusual year. It was, but not in the way we expected.

As a result of the increases, natural gasoline, in February, began to climb in price until it attained a price which had not been equalled at that season of the year for quite a period. Things looked rosy and when the market reached 13 cents in February, it was freely predicted that by hot weather the market would be somewhere in the neighborhood of 20 cents per gallon.

Then came the slump. California, Powell and Oklahoma fields got in their licks at the industry, crude broke sharply, refined prices tumbled and natural gasoline, a by-product, became a product without the buy.

The prices of 1922, in some instances as high as 22½ cents for Grade A, in the summer of 1923 were, like faith, "the evidence of things hoped for, the substance of things not seen." Up went the demand, down came the price. It was the infallible law of supply and demand made fallible. It was not how much could we get but how little could we expect. As the summer waned and indications pointed to no change, we expected little and we were not disappointed.

### Was Moving

There was this consolation, however. Natural gasoline was moving. None was being stored through failure to sell. Total gallonage helped to bring in revenue to the manufacturers, small though it was, but the outlook for winter was extremely bad.

Winter, always a period of depression, because of a low market and lack of demand, was doubly feared in 1923-1924. Manufacturers of natural gasoline saw a combination of no demand and no value. Having lost money on a large scale by reason of the low prices in the gasoline season of the year, there was nothing to look forward to during the cold weather but absolute ruin to many of the smaller manufacturers.

To add to the gloom, 1923 saw a large increase in the output of natural gasoline. Plants started in the winter of 1922-23 to take care of the increased demand in 1923 were completed in time to share in the general debacle. There was no overproduction, however, to accentuate the decline. None was needed.

It is said that it is always darkest just before dawn. But when dawn came in the latter part of November, natural gasoline manufacturers were loath to believe it was daylight; they thought it was a fire. However, through the decline of crude production, came an advance in refined products followed by an increase in the price of crude. Step by step natural gasoline has advanced in price, until at this writing we are getting just about a cent lower for Grade A than obtained in February last year, just before the slide.

That the production of crude has declined to a point where the menace of over production does no longer exist; that there is a strong market for refined products and that 1924 should be a big year for all branches of the oil industry, seems assured. With the winter almost past; with the spring demand soon beginning; with a large increase in the number of motor cars it appears as though the natural gasoline is out of the slough of despond and into the pleasant and fruitful valley of demand and is now climbing the hill of fair prices from which it slid so fearfully last winter.

It is said that the slide in France, where the ski jumping and bob-sled competition in the Olympic games is being held, is a bad one. Several minor casualties have occured. If the judges consider fear and terrible results as requisites of slides, they are respectfully referred to the slide that refined products encountered last year.

I have said our branch of the industry was suffering from "gas"tritis. The treatment for such an ailment is rest and fasting. We have had plenty of both and 1924 should see the industry fully restored to health.

# *Refiners Get Ready For Big March Meeting*

**Tulsa, Okla.**—Plans for staging the 1924 annual convention of the Western Petroleum Refiners Association, which is to be held in Dallas, Texas, from March 4 to 6, are rapidly taking shape and advance indications are that the meeting will exceed any previous gathering of the organization, both in the prominence and variety of the speakers and in the subjects to be discussed. General supervision of the plans for the convention is in the hands of Howard Bennette of Tulsa, secretary of the association.

Speakers for the convention have been selected with special regard as to their position in the industry as well as to their intimate knowledge of the inside workings of the refining branch. General arrangements for the convention program are in the hands of Geo. D. Locke of Chicago of the Barnsdall Refining Company, who is chairman of the association's program committee. The annual banquet of the association will be held and several prominent speakers are slated for appearance then.

All sessions of the convention will be held at the Adolphus Hotel in Dallas, which is to be convention headquarters. The sessions will be presided over by George N. Moore of Chicago of the Moore Refining Company, who is president of the Western Petroleum Refiners Association. Among the more important business to be taken up will be the election of officers for the coming year, the election of a board of directors and members of the association's executive committee. These elections will come toward the last of the three day session.

Present officers of the association besides Mr. Moore are P. M. Miskell of the Empire Refineries of Tulsa, Roy B. Jones of the Panhandle Refining Company of Wichita Falls, Texas, and W. L. Kistler of Producers and Refiners Corporation of Chicago, vice presidents; and Howard Bennette, secretary. Other officials of the organization include H. K. Davis, statistician; P. A. Conway, commerce counsel and traffic manager; Fayette B. Dow of Washington, D. C., counsel; and Ed P Byars of Fort Worth, Texas, Texas traffic representative.

### Present Members

Members of the present board of directors of the association include H. T. Ashton of St. Louis, Lubrite Refining Company; D. E. Buchanan of Tulsa, Chestnut and Smith Corporation; Wm. H. Cannady of Chicago; S. C. Collins of Ponca City, Ok'ahoma, Marland Refining Company; J. A. Corbett of Wichita, Kansas, Sterling Oil and Refining Company; A. L. Derby of Wichita, Kansas, Derby Oil and Refining Company; E. W. Goebel of Kansas City, Kansas City Refining Company; W. B. Hamilton of Wichita Falls, Texas, Texhoma Oil and Refining Company; C. L. Henderson of Wichita, Kansas, Vickers Petroleum Company; R. R. Irwin of Wichita, Kansas, White Eagle Oil and Refining Company; Elliott Jones of San Antonio, Texas, Elliott Jones & Company; C. M. Lamason of Tulsa, Pure Oil Company; A. E. Landsittel of Tulsa, Globe Oil and Refining Company; Geo. D. Locke of Chicago, Barnsdall Refining Company; C. L. Mayhall of Tulsa, Imperial Refining Company; E. R. Perry

(Continued on page 28)

The natural gasoline plant of the Phillips Petroleum Company in the Burbank field, Oklahoma.

# Conversion of Natural Gasoline Plants

## How Tidal Refining Company converted compression plants to the absorption method

*By Lloyd F. Bayer**

THE early gasoline plants were constructed for casinghead gas usually rich in gasoline content. The simpler compression process was first developed and continued to be used almost exclusively on casinghead gas until the last two or three years. In the period from 1913 to 1916 absorption type plants were installed on high-pressure lines to convey natural gas to the market. As first developed these plants were applied only to very lean gas, yielding one-fourth of a gallon or less per thousand cubic feet. That was under comparatively high pressure. For some time after their development it was felt that the successful operation of absorption plants was confined to lean gas.

With the rapid development of large oil fields, particularly in Texas, such as the Ranger and Breckenridge fields, where large volumes of gas with a relatively low gasoline content were produced, the absorption process was first generally applied on a large scale to casinghead gas. Although a number of difficulties were encountered requiring study and correction, the success of some of these plants led to the application of the low-pressure absorption process to casinghead gas of high gasoline content.

In the summer of 1920 the Tidal Refining Company erected a small plant at Keystone utilizing the absorption process on casinghead gas yielding at that time approximately 1.5 gallons per thousand cubic feet. This was the first absorption plant to be operated by the Tidal organization and, fortunately for later development, direct-fired stills were used in place of the more conventional type of steam still.

Before discussing the relative merits of these two types of plants, it may be well to briefly describe the operation of each. Casinghead gas which is obtained from the oil producing sand rises through the casing of the wells and is collected at the casingheads, from which it gets its name. From the casingheads it is conducted through pipe lines usually to vacuum pumps which pull a vacuum on the wells. In newer fields where vacuum is not desired it may be conducted directly to the intake compressors. Where vacuum pumps are installed the gas is discharged generally through a small set of cooling coils to the intake of the compressors.

**The rapid conversion of many compression gasoline plants into absorption plants all over the country has, quite naturally, made the experience of the Tidal Refining Company interesting to the trade. Mr. Bayer's report on the matter, while it is intended primarily for the man who has not had a close association with natural gasoline work, is, we believe of sufficient interest to the trade to warrant reproduction.—Editor.**

In the compression system the gas is compressed in two successive stages and is cooled in coils over which water is sprayed after each stage of the compression. The compression and subsequent cooling to atmospheric temperature condenses the natural gasoline which is trapped out in accumulator tanks. From the accumulator tanks it is conducted to storage tanks where it is weathered or blended and prepared for shipment.

In the absorption process the gas either from the discharge of vacuum pumps or direct from the wells in compressed to a low pressure varying usually from 10 to 40 lbs. per square inch, and subsequently cooled. This low stage compression usually produces some gasoline, larger quantities being produced from richer gases. The gas under this pressure is conducted through two absorbers in series, in which it meets a counter current flow of absorbent oil. This flow falls as a spray, stripping the gas of its gasoline content, and becomes itself enriched with this gasoline. The enriched oil passes through a vent tank to release wild vapors, and then through a heat exchanger to the stills in which the oil is heated to drive off the gasoline content. The stills operate continuously, the enriched oil flowing in at one end and the stripped oil leaving the other. Stripped oil, leaving the still, passes through the other side of the heat exchanger and delivers its heat to the enriched oil going to the stills. It is then further cooled by a water spray and reintroduced into the absorbers for another cycle.

The gasoline vapors leaving the still pass through an appropriate fractionating tower and then to a condenser in which a considerable proportion of the plant production is liquefied. Uncondensed vapors from the stills and vapors from the vent tank, together with any vapors involved in storage or loading are returned to a separate compressor called the recompressor, where they are subjected to 50 to 75 lbs. pressure and cooled.

Although this system is more involved than the compression process, the operation of the absorption system can largely be made automatic by means of float valves and thermostatic controls. The low stage compression of the absorption process requires less than one-half the horse power required in the two-stage compression process, and the power requirement of the auxiliary equipment, such as the oil pumps, is itself small. In general, therefore, the horse-power requirements of the absorption process are approximately one-half of the compression process.

In addition to requiring only one-half of the horse power, as pointed out above, the absorption process has other advantages as compared with the compression process. It is possible to extract a greater quantity of gasoline from the same gas, the increase ranging from 10 to 20 per cent. The yield from an absorption plant is only slight-

*From an article in a recent issue of Tidewater Topics.

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The plant is one of the largest ever constructed, operating with the absorption method

ly affected by the presence of air in the casinghead gas which has a very serious effect on the production in a compression plant. Varying quantities of air are always present in the casinghead gas where it is collected under a vacuum, and this becomes a serious problem in the old fields where the casings of wells are in poor condition, the gathering lines old, and the volume of gas per well low. The absorption process also separates out the maximum quantity of stable gasoline in the form of low stage and absorption fractions. The recompressor production alone is wild and may be weathered separately with less loss than the combined product could be weathered.

The first compression plants converted to absorption by the Tidal Refining Company were the Chelsea plants Nos. 61 and 62. By the installation of the absorption equipment at plant 61 and the conversion of the compression units to low pressure, the capacity of the plant was practically doubled, permitting the handling of the gas formerly handled by two compression plants of the Liquefied Petroleum Gas Company. With the exception of the increase made necessary in the field organization to care for the additional gas gathering system, the same organization that formerly operated plant 61 on the compression basis was able to operate it with the increased production on the absorption basis. Plant 62 was also converted to absorption, but as no additional gas was available approximately one-half the machinery was shut down. The buildings and machinery in the Liquefied lants were thus made available for other purposes, being moved to the Romarti plant in the Burbank pool and the plant in the Fox-Bush pool.

The conversion of plant 61 to absorption basis was completed in May, 1922, and plant 62 was put on a satisfactory basis on the absorption system in the latter part of September. The yield of gasoline per thousand cubic feet of gas has been materially increased to the extent of over 20 per cent. With the greater production from the same plants the operating cost per gallon has been reduced.

With the success of the absorption system, as applied on the large scale at Chelsea, the desirability of converting Drumright and Glenpool plants to the absorption process was apparent, both from the benefits to be gained in increased yield and decreased cost of operation and from the machinery and equipment which would be released for use in building the main plant in the Fox-Bush pool. Drumright gasoline plant operations were conducted in two separate plants, Numbers One and Two, located approximately one mile apart. By converting Number Two plant to absorption at low pressure the engines and compressors were capable of running double the volume of gas, thus permitting the gas previously handled by plant Number One to be diverted to plant Number Two. When this was accomplished, plant Number One was shut down, and all the machinery and buildings were shipped to Douglass, Kansas, to form the main plant in the Fox-Bush pool.

Glenpool operations were conducted in seven plants handling casinghead gas from the wells, and one plant at the loading rack recovering vapors released in loading tank cars. This latter plant was selected as the central point for the installation of an absorption plant to handle the majority of the gas from this field. Because of contract arrangements, it has been impossible as yet to shut down two plants in the field, but it is hoped at some later date the gas from these plants can be taken into the central plant. The plant known as the Simmons plant, located east of the central plant, was converted to low stage compression and absorbing, but there is no distillation or finishing of gasoline done at this plant. The absorbent oil from the Simmons plant is pumped from the central plant to the Simmons, where it absorbs the gasoline content of the gas and is pumped back to the central plant for distillation in conjunction with the absorbent oil used in the central plant. Machinery and buildings from Glenpool plants were also shipped to Douglass, Kansas, for use in the Fox-Bush plant, together with machinery from one of the Liquefied Petroleum Gas Company's plants in Chelsea, supplied the engine and compressor equipment for the north booster station in the Fox-Bush pool.

In addition to releasing this machinery, the change to absorption at both Drumright and Glenpool resulted in increased production and decreased operating cost.

## Gasoline Men to Hold Annual Meet in April

**Tulsa, Okla.**—The 1924 annual meeting of the Association of Natural Gasoline Manufacturers is to be held in Tulsa from April 23 to 25, according to a tentative announcement made by A. V. Bourque, secretary of the association.

The sessions likely will be held in the assembly room of the Tulsa high school, although final arrangements for this have not yet been made.

This year's program is expected to eclipse all previous efforts, both in the prominence and variety of speakers and in the attendance which gives indications at this early date of being representative of the natural gasoline industry, not only in the Mid-Continent but in the North and East, Middle West, Rocky Mountain and the West Coast sections.

The complete program with speakers and their subjects is to be announced later.

## Atlantic Refining Co. Opens Dallas Office

**Dallas, Texas.**—The Atlantic Refining Company of Philadelphia, Pennsylvania, has established a representative, T. N. Davey, in the Magnolia building here to begin purchasing refined products from the various independent refiners in North Texas and other Southwestern refining centers. Atlantic is also one of the major buyers of natural gasoline, and is expected to materially increase its purchases of natural gasoline as well as start moving refined products from the district via its tanker docks on the Gulf Coast.

A. V. Bourque, secretary of the Association of Natural Gasoline Manufacturers, has returned to Tulsa from New Orleans, where he attended the first annual meeting of the south central division of the United States Chamber of Commerce.

George L. Ratcliffe, vice president and in charge of natural gasoline plants and refineries of the Texas Pacific Coal and Oil Company with headquarters at Thurber, Texas, was a business visitor in Fort Worth late in January.

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# Calorized Tubes

Recently the A. C. Nielsen Company of Chicago, engineers, made an independent survey of the results of Calorizing in the Interstate Refineries, Inc. (Kansas City, Mo.) Their report shows that Calorized pressure still tubes are saving $4,539.98 a year.

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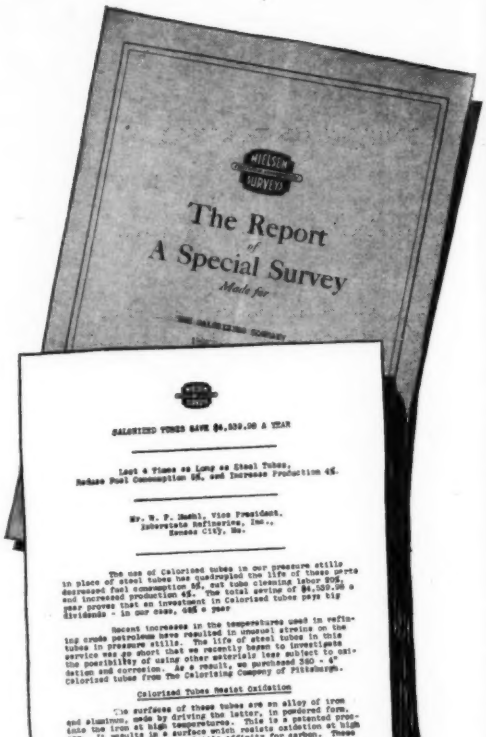



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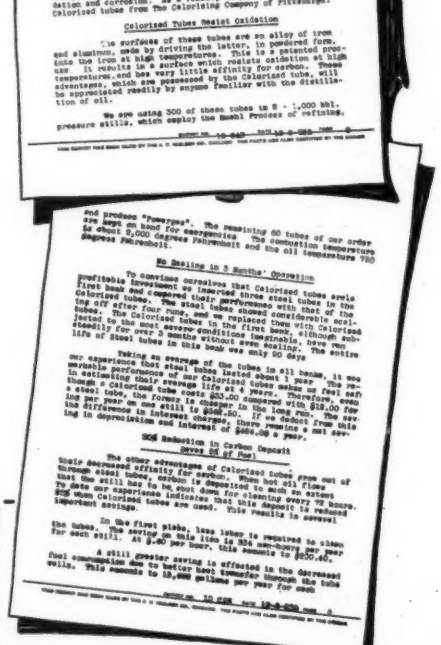


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# Getting the Most Out of Mexican Crude

## Methods used to obtain high yield from heavy oil and the results accomplished

*F. N. Williams,*
*A. M. Inst. P. T.*

THE handling of Mexican crude in refineries has been one of the greatest obstacles in modern refining methods and much has been published on various systems used to break up this grade of crude and obtain the lighter and more valuable products.

The preceding article on Mexican crude appearing in the January issue of The Refiner and Natural Gasoline Manufacturer, dealt with the distillation and anaylsis of the oil and the following article, which concludes the discussion, takes up the methods of refining.

In using sulphuric acid as a purifying medium, the acid acts both physically and chemically, colloidal coloring matter being precipitated and dissolved by the acid. Nitrogen, sulphur and oxygen compounds enter into the reaction but are not completely removed.

The distillates contain sulphur in many different combinations, the very lightest liquids contain considerable hydrogen sulphide in solution, and the light gases evolved are highly saturated with this material, a large percentage of which is removed in the wet scrubbers before the gas is stored in the gas holder.

### Steam in Stills

The use of steam in the stills during distillation aids materially in removing some impurities from the distillates.

The naphthas requires careful refining before it is brought into a condition to pass the "doctor" and "corrosion" test. It is noticeable that the lesser or greater percentage of sulphur contained in these distillates is in no way an indication of the outcome of the above mentioned tests. The only trouble encountered in actual use of Mexican gasoline containing a large percentage of sulphur was clogging of the strainers at the carburetor. The gum removed from the strainers was found to be almost entirely benzene soluble gum and free of coke in any form, and it was further found that the gasoline used in this test had been treated immediately after being distilled and before the resinous matter had been allowed to precipitate, the comparative warmth at the carburetor probably bringing about the precipitation. While the corrosion test is largely used in examining gasolines, it is doubtful if this test is of any more than means of comparison as the conditions under which it is conducted are quite foreign to the actual usage of the fuel.

### Fuller's Earth

The same gasoline as used in the above tests, yields the very best results if filtered through Fullers earth before use, or if it is allowed to age before acid treatment.

The gasoline used was treated immediately after original distillation, and no time was allowed for aging. It was composed of the straight distillate from the pipe stills and cracked naphtha from gas oil distillate.

Color, brownish yellow, gravity 54.0 Be. sulphur 0.356 per cent, odor rank and penetrating, and containing considerable hydrogen sulphide, most of which could be removed by cold water washes previous to acid treatment. After treatment the distillate was steam-stilled to 437 F. end point, 57.8 Be. gravity, 25 color, negative doctor test, and 0.25 per cent sulphur, odor, sweet and having some of the characteristic odor of gasoline made in pressure stills.

The main trouble in treating this distillate was in the length of time agitation was required to "break" the doctor treat and the large amount of sodium plumbite used, usually given in two doses. The doctor solution was a supersaturated solution of 15 deg. sodium hydroxide solution and litharge, no free litharge being introduced during agitation, as it seems to have no effect whatever in this form.

Considerable evaporation loss was encountered due to excessive agitation.

### Polymerization Loss

The loss due to polymerization was quite large, the higher end point material thus formed remaining in the steam still residue upon steam distillation, the loss depending upon percentage of cracked naphtha from gas oil distillate in the mixture, and also the length of time the distillate had been aged, if at all, before treatment.

In the case of straight cracked naphtha from gas oil distillate, and the light cracked products from pressed distillate, which were obviously composed of a large proportion of unsaturates, the polymerization loss was quite high and far exceeds the loss experienced when refining pressure distillates, and it may be mentioned that the loss is lessened considerably upon redistillation if straight steam distillation is applied, and increased if the naphtha is subjected to fire distillation.

Increasing the amount of sulphuric acid used also increases this particular loss, within certain limits, therefore the naphtha should in all cases be aged before treatment when it will be found that very little acid is required.

To obtain the best results from Mexican gasoline distillates, the straight naphtha from the pipe stills should be kept apart from the cracked material and afterward mixed.

The cracked material may be best handled by re-running it in the presence of steam, treating, and then steam stilling to specifications.

The typical treatment for the straight naphtha is 2.5 pounds of sulphuric acid per barrel, agitating 25 minutes, settling 45 minutes, drawing off the acid, still washing with cold water for 40 minutes, then agitating with fresh water for 15 minutes or more, more water washes should be given if necessary to remove the traces of acid, as, if the oil is washed thoroughly, a smaller quantity of doctor solution will be required.

The oil is then agitated with half a gallon of spent doctor, per barrel (the spent doctor is that which has been previously used but still retains enough of its original properties to be of use) and 15 pounds flowers of sulphur. This is allowed to subside and the solution drawn off, and one-half gallon per barrel of fresh 18 Be. doctor solution, together with 40 pounds flowers of sulphur. About 45 minutes average agitation is required to secure "break".

The oil is then allowed to settle for about two hours, all the settled solution drawn off, and then washed with water for 15 minutes, lightly agitating during the wash. The oil is then settled until free of water and pumped into storage.

The proper conduct of distillation plays a very important role in the ease or trouble experienced in the subsequent steps of refining this material, as is the case with all oils, the distillation and efficient separation of the vapors during distillation is without question the most important function of oil refining.

### Treating Cracked Naphthas

The amount of acid required and the trouble experienced in treating cracked naphthas depends upon the number of times the naphtha has been distilled and after distillation, upon the time it is aged. If the naphtha has been re-distilled and aged properly a small amount of acid may be used with good results; on the other hand, if it is treated immediately after it is made, much trouble is encountered in treating, and a great deal of the sulphonated hydrocarbons remain in the gasoline and distill over in the final distillation, giving a high end point, a sample of which, when exposed to direct daylight will change colors, first pink, then successively lavender, blue and finally depositing a precipitate of resin like substance, the oil assuming a fairly permanent yellowish color, which is not affected by further acid treatment and can only be improved by re-distillation.

### Treating Kerosenes

Kerosene from Mexican crude may be treated to a first class product by the use of large quantities of acid and re-distillation.

All kerosenes shown in the table on the following page were treated with, first 20 pounds per barrel of fuming sulphuric acid, followed by 16 pounds per barrel of 66 degree acid, washed, and doctor treated.

Tested in lamps, the wick encrustation was better than expected, the flow through the wick or capillarity was good, the flame white with very high candle power, but the deposit on the chimney was heavy and this fault could not be eliminated except by further distillation and subsequent filtration through Fullers earth.

### Kerosene Derived From Naphtha Bottoms

Naphtha had been treated with five

TESTS OF VARIOUS KEROSENES FROM MEXICAN CRUDE

| | Before treatment | After treatment |
|---|---|---|
| Sample No. 1 | | |
| Yield 7.5% | | |
| Gravity | 44.6 Be. | 44.8 Be. |
| Flash | 130 F. Tag. O. C. | 130 F. Tag. O. C. |
| Fire | 156 F. Tag. | 158 F. Tag. |
| Sulphur | 0.847% | 0.538% |
| Color | | |
| Doctor | Positive | Negative |
| Sample No. 2 | | |
| Yield 10.0% | | |
| Gravity | 42.3 Be. | 42.7 Be. |
| Flash | 144 F. Tag. O. C. | 146 F. Tag. O. C. |
| Fire | 178 F. Tag. | 148 F. Tag. |
| Sulphur | 1.074% | 0.783% |
| Color | | 25 |
| Doctor | Positive | Negative |
| Sample No. 3 | | |
| Yield 5.0% | | |
| Gravity | 47.0 Be. | 47.0 Be. |
| Flash | 108 F. Tag. O. C. | 108 F. Tag. O. C. |
| Fire | 130 F. Tag. | 130 F. Tag. |
| Sulphur | 0.671% | 0.482% |
| Color | | 25 |
| Doctor | Positive | Negative |

pounds per barrel, 66 degree acid before being steam stilled.

Steam still naphtha bottoms, rerun straight fire distillation.

First 5% overhead—naphtha.
Gravity 51.2 Baume.
Next 65% overhead—kerosene distillate.

| | |
|---|---|
| Gravity | 45.1 Be. |
| Flash | 140 Tag. O.C. |
| Fire | 170 Tag. O.C. |
| Sulphur | .544% |

Treated with 15 pounds per barrel of 66 deg. acid.

| | |
|---|---|
| Gravity | 65.6 Be. |
| Flash | 136 Tag. O.C. |
| Fire | 164 Tag. O.C. |
| Sulphur | .293% |
| Color | 23 |
| Doctor | Neg. |

30% Residue. Gas oil.

| | |
|---|---|
| Gravity | 35.1 Be. |
| Flash | 245 F. P. M. |
| Sulphur | 1.45% |

The color of the kerosene is not improved by filtering.

A portion of the same naphtha bottom rerun over two per cent by volume of 30 Be. caustic soda solution.

First 90% overhead—kerosene distillate.

| | |
|---|---|
| Gravity | 44.9 Be. |
| Flash | 150 Tag. O.C. |
| Fire | 180 Tag. O.C. |
| Sulphur | .236% |

Treated with 10 pounds per barrel 66 deg. acid.

| | |
|---|---|
| Gravity | 45.0 Be. |
| Flash | 150 Tag. O.C. |
| Fire | 180 Tag. O.C. |
| Color | 20 |
| Sulphur | .216% |
| Doctor | Neg. |

### Lye Increases Yield

By running over lye the yield of kerosene from the naphtha bottom is increased from 65 to 90 per cent, and the amount of acid used in treating kerosene is reduced from 15 to 10 pounds per barrel, and the sulphur content from .293 to .216 per cent.

An oil suitable for very light fuel, low class burning oil, etc., was made by treating the kerosene distillate with 15 pounds of 66 degree acid and finishing in the usual way.

All of the distillates are much improved by fullers earth filtration, particularly those cracked naphthas, which had to be treated hurriedly before ageing, and they could be finished a first class product by following the acid treatment with a light clay filtration.

The use of sulphur dioxide gave promise of excellent results but experimental and research work along that line was not finished and the incomplete results will not be given here.

### Treating Lube Oils and Paraffin Distillates

It is good policy to treat the paraffin distillate from Mexican crude before pressing, as same is made at fairly high temperatures and contains some resinous and coky matter. The treatment removes asphaltic matter, which burden would otherwise fall jointly on the sweaters and final filtration.

This distillate is easily treated using from six to eight pounds per barrel of 66 degree acid, agitating heavily for about 30 minutes, settling thoroughly and then transferring to the wash agitator. The wash agitator is filled to the top of the cone with water and the oil transferred onto it, thus preventing the fine particles of acid sludge remaining in the oil from sticking to the cone. When the oil is all transferred the water is drawn off, and about 10 per cent of warm water 100 to 120 degrees Fahrenheit is added. This is allowed to stand for one hour and then drawn off. The oil is then neutralized with caustic soda solution 6 Be., gravity using .25 gallons of solution per barrel of oil, agitating thoroughly until the oil is neutral. Agitation is then stopped and 10 per cent more water at 160 degrees Fahrenheit is introduced, allowed to stand for three or four hours. At the end of this period the water is drawn off and the oil will be found to be almost clear.

This oil should be treated at as low a temperature as possible compatible with good results in order that an unnecessary burden shall not be placed upon the refrigeration plant when this material is to be chilled for pressing, furthermore, the oil should be absolutely free of water when it is pumped from the agitators, as a little water left in it from time to time would finally accumulate a quantity in the storage tanks, which might be picked up by the wax plant pumps and discharged into the chillers where some possible damage might occur.

### Non Vis Pale Oils

These oils do not require acid treatment or rather I mean to say that they may be handled without acid. It is obvious, however, that they would be improved in the final usage by acid treatment followed by the usual filtration.

The method used is as follows: one gallon per barrel of caustic soda solution 20 Be. gravity is applied while agitating the oil rapidly, the oil assumes a reddish-brown color. Agitation is continued for 30 minutes, adding about 20 per cent of hot water at about 150 to 160 degrees Fahrenheit. At this point live steam is applied through the sprays until a temperature of 180 to 190 degrees Fahrenheit is attained. If at this stage the brown color does not break out as a precipitate, add 15 pounds of flowers of sulphur. After precipitation occurs, let stand over night. The average color of the distillate before this treatment is 2¼, and after treatment is 2¼.

The oil is finally filtered through fullers earth, which filtration does not improve the color of the oil regardless of the amount of clay used. This manner of treatment destroys the offensive odor of the distillate and also seems to fix the color of the oil, as air or heat have very little oxidizing effect on it.

### Red Lubricating Oils

It is necessary to give these oils one or two preliminary small doses of acid to remove moisture before giving the regular amount of acid. When the oil is perfectly dry, the oil is given five pounds of 66 degree acid per barrel, which is agitated from 30 to 45 minutes, settled four to six hours, the accumulated sludge drawn off, then six pounds per barrel of acid is applied, agitated for 30 minutes and the acid sludge broken out with water. The oil is allowed to settle until all the sludge has had time to settle. The oil is then transferred to the wash agitator and when about half of the oil is transferred, 3 Be. caustic soda solution is added until enough is present to secure complete neutralization and an alkaline reaction. It is the policy of some treaters to add soap solution at this point to prevent emulsification, or rather to gather into the soap solution all the materials which would tend to produce soaponification. Hot water is added, and if soap solution is used agitation is continued and live steam applied until the proper reaction is noted. When the agitation is stopped, the oil is allowed to settle over night, when the oil should be clear and nearly bright and clear. The oil is air blown until bright. The soap used is usually cotton seed caustic soda soap, diluted to the proper consistency with water.

### Using Silica-Gel

Mexican naphthas filtered through silica-gel are of low content and excellent in odor, in some cases noted the sulphur of the naphthas thus treated being reduced to less than 0.005 per cent.

The gel also was used to take up still gases, until saturated when the gel was heated driving the gases through a condenser, yielding a very light, sweet product as shown in Figure 2.

Silica-gel is a hard, glassy substance of very porous nature, and is prepared by mixing in proper proportions sulphuric acid and sodium silicate solution. The primary product formed is silicic acid. The silicic acid sets to a gel, is broken into pieces and thoroughly washed. It is then dried at a carefully regulated temperature. The remaining water is removed in the activation process, when the gel is ready for use.

The gel after use is restored to its

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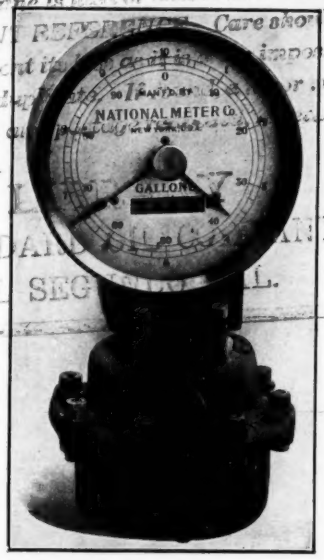


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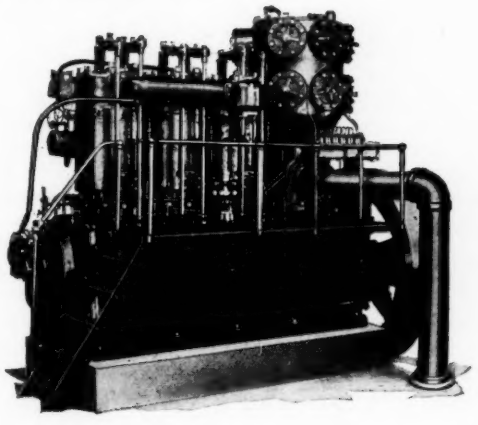

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former efficiency by reactivation. Details of the use of silica-gel may possibly be obtained from the Davison Chemical Company of Baltimore, Maryland.

### Fullers Earth

The adsorption method of purification may be used successfully on Mexican products. In the case of fullers earth the selection of earth of the proper coarseness for the particular oil to be filtered, the temperature best suited for efficient filtration is of importance. There is no set rule applying to the best filtering temperature, nor can the efficiency of the clay be determined by chemical analysis. Actual test is the only sure guide.

Oil to be subjected to filtration must be absolutely dry to obtain best results, as the presence of water would defeat the purpose of the filtration. The clay would absorb the water first and assume a condition rendering it totally unfit for filtration purposes.

Fullers earth before use should be burned to remove water and organic matter, but care must be taken to avoid over burning.

In the case of Mexican oils a yield of three to four tons of oil of color per ton of clay may be expected, varying with the class and condition of the oil (this applies to lubricating oils). After use, the clay is washed with naphtha while in the filters and steamed (the clay must be steamed until all the naphtha is removed, as failure to do this may result in a serious fire when the clay is subjected to the revivification process).

The clay is revived by burning in a suitable clay burner, of which there are many types, at about 1000 degrees Fahrenheit.

### Still Cuts

The first run given is a dry distillation to coke giving the gasoline, kerosene, gas oil and coke yield. Gravity of crude, 20.3 Be.

| Cut | Per cent | Vapor temp. | Still temp. | Gravity Be. | |
|---|---|---|---|---|---|
| 1 | 2.5 | 265 | 390 | 66.0 | Naphtha 15.0 |
| 2 | " | 335 | 435 | 58.8 | per cent of |
| 3 | " | 355 | 465 | 54.0 | crude gravity- |
| 4 | " | 400 | 510 | 51.4 | 53.7 Be. |
| 5 | " | 440 | 550 | 48.6 | Kerosene dist. |
| 6 | " | 475 | 585 | 45.5 | 7.5% gravity- |
| 7 | " | 505 | 620 | 42.9 | 40.8 Be. flash- |
| 8 | " | 530 | 650 | 40.6 | 150 T. O. C. |
| 9 | " | 565 | 680 | 38.6 | fire-182 T. O. |
| 10 | " | 585 | 700 | 36.1 | C. |
| 11 | " | 605 | 725 | 35.1 | |
| 12 | " | 615 | 740 | 34.1 | |
| 13 | " | 620 | 750 | 33.3 | |
| 14 | " | 625 | 760 | 32.7 | |
| 15 | " | 625 | 765 | 32.5 | |
| 16 | " | 630 | 770 | 32.1 | |
| 17 | " | 630 | 775 | 31.7 | |
| 18 | " | 635 | 775 | 31.3 | |
| 19 | " | 620 | 775 | 31.5 | |
| 20 | " | 585 | 765 | 33.2 | Gas oil dist.- |
| 21 | " | 580 | 735 | 35.6 | 54.5% gravity |
| 22 | " | 595 | 750 | 34.5 | -33.3 Be. |
| 23 | " | 580 | 745 | 34.2 | |
| 24 | " | 585 | 750 | 33.9 | |
| 25 | " | 575 | 770 | 34.7 | |
| 26 | " | 560 | 755 | 36.1 | |
| 27 | " | 565 | 745 | 36.0 | |
| 28 | " | 560 | 735 | 35.9 | |
| 29 | " | 540 | 730 | 35.2 | |
| 30 | " | 530 | 690 | 43.1 | |
| 31 | 2.0 | ... | ... | ... | |

Total overhead .....77.00%
Coke . .....16.16%
Gas and loss ..... 6.84%

Above gasoil distillate reduced to test.

Overhead, 10%-5.45% of crude.
Gas oil test 90%-49.05% of crude.
Gravity, 30.9 Be.
Flash, 160 F. P. A.
Total naphtha, 20.45%.
5.45% from the gasoil dist. and 15.0 from the crude.
Gravity, 54.4 Be.
I. b. p., 128 F.
End point, 540 F.
Above naphtha steam stilled for gasoline.
Overhead, 90%-18.405%.
Gravity, 57.1 Be.
I. b. p., 126 F.
End point, 450 F.
Bottom 10%-2.045% to gas oil.
Total percentages:

Gasoline . .....18.405%
Kerosene . ..... 7.500
Gas oil . .....51.095
Coke . .....16.160
Gas and loss ..... 6.84
100.00%

Cuts, and record of run in coke stills.

Stills charged with 14-16 gravity, topped Mexican crude.

Temperature of charge, 235°F. Fired

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*Storage Tanks- Tank Cars-Brick- Outdoor Woodwork*

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at 9:15 p. m.. Over at 1:00 a. m.
Intermediate worm:
Cut from over to 46.0 Be.—Gas oil distillate.
45.0 to 41.0 Be.—kerosene.
41.0 to 32.5 Be.—gas oil test.
Light worm:
Over to off—Gas oil distillate.
No. 1 Heavy Worm:
32.0 to 23.0—Paraffin distillate.
23.0 to off—Heavy ends.
No. 2 Heavy Worm:
Cut out of para dist. at 22.0 grav.

| Hour | light inter. | No. 1 hy. | No. 2 hy. | Remarks |
|---|---|---|---|---|
| 1 AM | | 46.7 | | |
| 2 " | | 41.0 | 45.9 | |
| 3 " | | 38.4 | 43.4 | No.1 and 2 hy. on wax pot 3.30 p.m |
| 4 " | | 35.2 | 41.0 | |
| 5 " | | 32.9 | 37.6 | |
| 6 " | | 30.6 | 34.8 | |
| 7 " | 34.9 | 28.7 | 32.5 | |
| 8 " | 34.0 | 27.5 | 29.6 | |
| 9 " | 33.6 | 26.1 | 28.4 | steamed wax pot 9.30 p.m. |
| 10 " | 33.0 | 25.0 | 27.3 | |
| 11 " | 32.7 | 24.1 | 26.3 | |
| 12 noon | 31.5 | 23.4 | 25.7 | steamed out stills overhead 11.30 p.m. |
| 1 PM | 30.5 | 22.7 | 24.9 | |
| 2 " | | 19.9 | 22.0 | |
| 3 " | | 17.5 | 19.8 | stripped 1.30 a. m. |
| 3.30 | | 15.3 | | |

The above percentages are changed materially if the refiner has installed cracking stills. The gas oil content 51.09 5% could be converted into about 42% of gasoline with a residue of fuel oil, as follows:

| | |
|---|---|
| Gasoline, straight run | 18.40% |
| Gasoline, cracked | 21.45% |
| Kerosene | 7.500 |
| Fuel oil | 26.050 |
| Loss, cracking stills | 3.577 |
| Coke | 16.160 |
| Gas and loss, coke stills | 6.840 |
| | 100.000% |

A comparison of the return from products from each case is given below, not considering the extra cost of labor, fuel, investment. Figures based on 5000 barrels of crude daily. Gasoline, 8 cents per gallon; kerosene, 4 cents per gallon; fuel oil, 85 cents per barrel; gas oil, 3 cents per gallon:

**Without Cracking Stills**

| | |
|---|---|
| Gasoline | $3,092 04 |
| Kerosene | 630 00 |
| Gas Oil | 2,588 98 |
| Total | $5,311 02 |

**With Cracking Stills**

| | |
|---|---|
| Gasoline | $5,697 15 |
| Kerosene | 630 00 |
| Fuel Oil | 1,107 50 |
| Total | $8,434 65 |

The above figures do not include the revenue from coke, which will be somewhat larger when cracking stills are used.

**Mexican Crude Run in Tower Stills for Maximum Gas Oil Yield**

| Hour | Light worm | Inter worm | Heavy worm |
|---|---|---|---|
| 6 p. m. | not over | not over | 49.9 |
| 7 " | " " | 52.8 | 43.6 |
| 8 " | " " | 47.8 | 40.7 |
| 10 " | 55.0 | 34.2 | 33.0 |
| 11 " | 56.2 | 33.1 | 32.3 |
| 12 " | 54.9 | 32.6 | 31.3 |
| 1 a. m. | 53.2 | 31.8 | 29.6 |
| 2 " | 52.1 | 30.6 | 28.5 |
| 3 " | 51.6 | 29.6 | 27.5 |
| 4 " | 50.2 | 28.9 | 26.4 |
| 5 " | 49.4 | 27.6 | 25.3 |
| 6 " | 48.3 | 26.2 | 24.3 |
| 7 " | 45.0 | 25.6 | 22.9 |
| 8 " | 42.6 | 24.8 | 21.4 |
| 9 " | 40.8 | 23.9 | 20.2 |
| 10 " | 38.3 | 24.6 | 18.9 |
| 11 " | 39.2 | 25.4 | 16.1 |

Remarks: All distillates between 38.0 Be. and wax tailings are considered No. 1 gas oil.
Distillate to wax pot at 11 a. m. Steam on at 1:30 p. m. Hauled fire at 3 p. m. Stripped at 4 p. m.

**Distillation test of a 32.0 gravity Mexican Gas Oil**

Gravity, 32.0 Be.
Flash, 154 F. P. M.
I. B. P., 300 F.

| Per Cent | Fahrenheit | Baume |
|---|---|---|
| 10 | 440 | 45.8 |
| 20 | 480 | 40.7 |
| 30 | 510 | 37.7 |
| 40 | 545 | 35.0 |
| 50 | 570 | 33.0 |
| 60 | 595 | 31.3 |
| 70 | 625 | 29.5 |
| 80 | 660 | 27.5 |
| 90 | 700 | 24.8 |

85% distills between 300 and 700 F.

**Analysis of 35.6 Gravity Mexican Gas Oil**

Gravity, 35.6 Be.
Specific Gravity, 0.8485
Pounds per gallon, 7.039
Coke, 1.0%
Sulphur, 1.54%
B. T. U. per pound, 18,908
B. T. U. per gallon, 133,093.4

**Comparison of Mexican Gas Oil and Mid Continent as Used for Gas Manufacture**

The Mexican gas oil was made from


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Natural Gasoline Plant
Executive
Superintendent
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(BE SURE TO CHECK CLASSIFICATION)

***TABLE OF COMPARATIVE OPERATING RESULTS OBTAINED**

| | —Kind of Oil Used— Mid-Continent | Mexican |
|---|---|---|
| Number of days of test | 11 | 5 |
| Gas produced, total corr. M cu. ft. | 21,023 | 10,299 |
| Gas produced average daily corr. M. cu. ft. | 1,911 | 2,060 |
| Oil used, total gals. by tank | 69,890 | 34,089 |
| Oil used total gals. by meters | 70,120 | 33,760 |
| Oil used, av. gals. per M. cu. ft. by tank | 3.32 | 3.31 |
| Oil used av. gals. per M. cu. ft. by meters | 3.34 | 3.28 |
| Coke used, av. lbs. per M. cu. ft. | 39.30 | 35.33 |
| Ash produced, total lbs. | 53,605 | 23,640 |
| Ash produced, av. daily lbs. | 4,873 | 4,728 |
| Ash produced in per cent of coke used | 6.49 | 6.50 |
| Calculated B.T.U. contributed per gal. of gas oil to heating value of gas | 97,100 | 104,500 |
| Calculated cu. ft. of oil gas made per gal of oil used | 52.2 | 59.4 |
| Temp. of brick, average in carburetor in deg. F. | 1,350 | 1,357 |
| Temp. of brick, average in superheater in deg. F. | 1,320 | 1,321 |
| Temp. of brick, average in gas machine deg. F. | 1,335 | 1,339 |
| Temperature of gas at condenser outlet, F. | 152 | 147 |
| Temperature of gas at purifiers inlet, F. | 111 | 107 |
| Temperature of gas at purifiers outlet, F. | 96 | 91 |
| Temperature of gas at station meter outlet, F. | 89 | 84 |
| Temperature of outside atmosphere in F. | 72 | 72 |

**COMPARATIVE RESULTS OBTAINED BY CRACKING TESTS AT THE LABORATORY***

| | —Kind of Oil Used— Mid-Continent | Mexican |
|---|---|---|
| Average temperature of cracking F. | 1395 | 1360 |
| Gals. of oil used per M. cu. ft. of gas made | 3.34 | 3.36 |
| Cubic ft. of oil gas produced per gal. of oil used per M. ft. of gas | 50.1 | 52.2 |
| Per cent by weight of oil forming gas | 55.8 | 57.3 |
| Per cent by weight of oil forming tar | 28.9 | 27.5 |
| Per cent by wt. of oil forming carbon | 15.3 | 15.2 |
| BTU contributed per gal of oil to total heating value of gas made | 91,000 | 99,200 |
| Analysis of finished gas: | | |
| Carbon dioxide | 4.0 | 3.8 |
| Illuminants | 8.0 | 7.8 |
| Oxygen | 0.4 | 1.0 |
| Carbon monoxide | 33.4 | 30.6 |
| Hydrogen | 33.1 | 30.9 |
| Methane | 16.2 | 18.7 |
| Nitrogen | 4.9 | 7.2 |
| Total BTU per cu. ft. of gas | 565 | 588 |
| Specific gravity of gasses | .634 | .640 |
| Hydrogen sulphide in grains per 100 feet of finished gas basis of 100 grains of $H_2S$ in the blue gas portion | 103 | 158 |

20.0 gravity Mexican crude; complete tests were made.

Twenty-four determinations of the total value of the make gas (at outlet of station meter) were made, or one each hour.

Three determinations of the total heating value of the make gas, after being subjected to the cooling for three hours at the temperature of the water in city mains, were made or one each shift.

Three analyses of the blue water gas were made, or one each shift.

Three analyses of the carburetted water-gas or "make" gas were made, or one each shift.

Twelve determinations (by the Tutwiler apparatus) of the hydrogen sulphide ($H_2S$) in the crude carburetted water gas at the inlet to the purifiers were made, or one each two hours.

Six determinations (by the Tutwiler apparatus) of the yhdrogen sulphide ($H_2S$) in the crude blue water gas at the inlet to the carburetter were made, or one every four hours.

One determination (by the referee's apparatus) of the total sulphur in the finished carburetted water gas was made upon an average daily sample.

One determination of the naphthalene content of the finished gas was made upon an average daily sample.

Twenty four readings each of the temperatures of the condenser outlet, inlet to purifiers, outlet from purifiers and outlet of station meter were made or one set each hour.

Nine readings of the temeperatures of the city water used for cooling the "make" gas were made or one each hour for each three hour cooling period for each shift.

One continuous daily record chart of temperature for each carburettor and each superheater of each gas machine operated.

Twenty-four readings of station meters statements were made or one each hour. Twenty four reading of oil meter statements for each gas machine operated were made or one each hour.

One reading of the gauge on gas oil storage tank was made.

In addition, all generator fuel was weighed so that the amount charged daily was known; the generator fuel was sampled daily so that average composition could be determined, and the ash removed from the generators also was weighed so that a daily total could be recorded.

Other observations in connection with tests upon matters of minor interest, were also made.

During the period from 7 A. M. September 19th to September 30th an eleven day test was run upon the Mid-Continent mixed gas oil in two gas machines. On the 30th of September a change was made to Mexican gas oil. From 7 A. M. October 1st, until 7 A. M. Oct. 6th., a second series of tests, covering a five day period, were made upon the Mexican gas oil in the same gas machines, under as near comparable conditions as possible to those existing during the eleven day test period previously mentioned. On October 6th two additional gas machines were started with the object of running the gas works at full load with the Mexican gas oil in order to note the general effects, if any, produced by this condition. On October 7th and 8th special tests were run upon the rate of absorption of the hydrogen sulphide contents of the gas by the various purifiers, and on the latter day in particular, a series of comparative tests were run in which the works were run alternately with Mid-Continent mixed oil and Mexican gas oil and tests made by a Tutwiler apparatus to determine the grains of sulphuretted hydrogen ($H_2S$) per 100 cubic feet of gas at the inlet to the purifiers and at the outlet of each purifier when the gasses were being passed

(Continued on page 26)

**COMPARATIVE RESULTS ON PURIFIER SYSTEM**

| | Kind of Oil: Mid-Continent | | | Mexican | | | Mexican | | |
|---|---|---|---|---|---|---|---|---|---|
| | Rate of flow through purifiers in cu. ft. per hour: 121,500 | | | 124,000 | | | 159,700 | | |
| | $H_2S$ per 100 cu. ft of gas | | | $H_2S$ per 100 cu. ft of gas | | | $H_2S$ per 100 cu. ft of gas | | |
| | Con't in grains | Rem'vd grains | Per cent | Con't in grains | Rem'vd grains | Per cent | Con't in grains | Rem'vd grains | Per cent |
| Crude | 91 | | | 135 | | | 172 | | |
| Box No. 1 | | 81 | 89 | | 123 | 91 | | 153 | 89 |
| Outlet Box No. 1 | 10 | | | 12 | | | 19 | | |
| Box No. 2 | | 2 | 2.2 | | 4 | 3 | | 15 | 8.7 |
| Outlet Box No. 2 | 8 | | | 8 | | | 4 | | |
| Box No. 3 | | 8 | 8.8 | | 8 | 8 | | 4 | 2.3 |
| Outlet Box No 3 | 0 | | | 0 | | | 0 | | |
| Box No. 4 | | 0 | | | 0 | | | 0 | |
| Outlet Box No. 4 | 0 | | | 0 | | | 0 | | |

**ANALYSES OF THE TWO COMPARED OILS**

| Kind of test— | Mid-Continent Mxd gas oil Deep brown | Mexican gas oil Deep brown |
|---|---|---|
| Baume deg. of the original oil at 60 F. | 27.1 | 26.9 |
| Specific gravity of original at 60 F. | .8912 | .8923 |
| Fractional distillation. I. B. P. | 213 | 292 |
| 213 F. to 300 F. Fraction by wt. per cent | .70 | ... |
| 292 F. to 300 F. Fraction by wt. per cent | ... | .10 |
| 300 F. to 400 F. Fraction by wt. per cent | .10 | 2.45 |
| 400 F. to 500 F. Fraction by wt. per cent. | 25.70 | 12.80 |
| 500 F. to 600 F. Fraction by wt. per cent. | 36.05 | 30.60 |
| 600 F. to 682 F. Fraction by wt. per cent | 34.55 | ... ... |
| 600 F. to 700 F. Fraction by wt. per cent. | ... ... | 36.80 |
| 700 F. to 748 F. Fraction by wt. per cent. | ... ... | 16.65 |
| Residue | 1.00% coke | .50% coke |
| Loss | 1.90 | .10 |

| Gravity of fraction at 60 F. in— | Be. | sp. gr. | Be. | sp. gr. |
|---|---|---|---|---|
| 300 F. to 400 F. fraction | ... | .... | 47.0 | .7910 |
| 400 F. to 500 F. fraction | 33.9 | .8545 | 37.3 | .8368 |
| 500 F. to 600 F. fraction | 22.4 | .8783 | 30.4 | .8728 |
| 600 F. to 682 F. fraction | 25.9 | .8980 | ... | .... |
| 600 F. to 700 F. fraction | ... | .... | 24.7 | .9050 |
| 700 F. to 748 F. fraction | ... | .... | 19.0 | .9396 |
| Total sulphur in original oil (by Mahler bomb) | | .24% | | 1.65% |
| Flash point, by Elliott open tester | | 193 | | 151 |
| Burning point by Elliott open tester | | 218 | | 194 |
| Cold test | | less than 21 F. | | 21 F. |
| Specific viscosity at 60 F. (relative to water as 1) | | 1.69 | | 2.39 |

*R. B. Harper.

# Lubricants From Vegetable and Mineral Oils

## One company combines two to make gasoline engine product with greater efficiency

*By Grady Triplett*

THE PROCESS of forming a lubricant of castor oil and mineral oil is one of distillation and compounding, rather than refining. Methods used by the Castor Oil Products Company of Houston, Texas, are patented. Some details of the process are not made public by holders of the patent. But sufficient of it is given to comprehend the advantages of the product and reasons for adopting the methods.

Castor oil as a lubricant is ages old. Mixtures of it for gasoline engine lubrication have been many. During the world war, castor oil and mineral oils were mixed for aviation use in France. But the oils were stirred for long periods to assure a mixture. There are several processes of blending castor and mineral oils, some being known and used in England. Most of these, however, are too expensive to permit putting the product out as a competitor of mineral oils.

Some of the properties of castor oil for lubricating internal combustion engines and the history of the use of castor oil are given in the following extract from bulletin No. 867, United States Department of Agriculture:

"The insolubility of castor oil in such products is given for its specific advantage in such cases (when mixed with gasoline in the cylinders).

"Some authorities assert that castor oil is preferable to mineral oil because gasoline does not wash it out of the crank case so readily, which is, of course, a corollary of the above. However, mixtures of cylinder mineral oil treated so as to maintain their homogeneity, are stated after direct trial to be more satisfactory, although the mixtures are perfectly soluble in gasoline. Castor oil, of course, can be used as a lubricant in other types of motors, but as the supply has been somewhat limited and at the same time the price materially higher than that of high grade mineral oil, it was found that the latter can be used in the rotary types. Abroad, however, castor oil was used almost exclusively in all kinds of aviation motors. The reason given was that castor keeps its viscosity better, sticks better, and protects the cylinder walls, valve seats, and other parts. A mixture of castor oils, containing a preponderating percentage of the latter, has been universally used in stationary motors."

When D. K. Dodge and J. W. O'Brien set about to get a blend of castor and mineral oils, they wanted to find a product that would carry the lubricating qualities of castor oil as well as keep its "body" through a slower breaking down process in contact with gasoline in gasoline motor cylinders.

Experiments in various blends, followed by road tests, brought them to the present process of turning out the product sold under the trade mark of Castorblend.

Castor oil of the drug store type, that so well hated by young America, is used. It is put through a process of distillation until certain acid qualities are removed. The temperatures required for removing the acids are secrets with the two men. They are not given in the application for patent, not being required.

With the acid content removed, the castor oil is ready for compounding with the mineral oil. This is done under pressure, at specified temperatures, which as in the above case are not made public. The whole process is to make the two oils miscible, which is not possible in their untreated states.

The mineral oils used in the process are from Coastal crudes. Pale filtered oils, run according to specification, are required for the success of the process. Even the amounts of each oil for the proper miscibility must be at fixed proportions to get the products turned out as Castorblend. It is stated that the knowledge of proper distillation of castor oil and the knowledge of the proper mineral oils would avail nothing, without knowing the proportions of the two for getting the blend.

Learning the proportions for effective blending was a process of trial and error. The two men spent six months in experimenting, before deciding on the process for which the patent was asked. When a proportion was developed for trial, the result was put in an automobile and a road test made. The automobile was driven over several hundred miles, after which the oil was taken from the crank case and tested, to determine how well it had served.

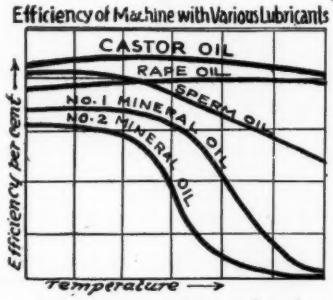
Later the blended product was put under test, similar to that used to determine the efficiency of oils under a heavy load and under rising temperature.

Results of a test on various oils are shown in Figure 1, where straight castor oil came first. Results of this test were reported as follows:

"When the load of the testing machine was increased and the temperature of the lubricant raised, there was found that at a certain point there was a more or less sudden falling off in the efficiency of the machine and hence in the efficiency of that particular oil as a lubricant. This point is known as the critical point or critical temperature. The critical temperature of castor oil was found to be higher than that of mineral oils and the castor oil was found to give practically a constant efficiency in spite of increased temperature." (Shown in Figure 2.)

These qualities were found to have been somewhat maintained in the blend of castor oil with mineral oil. Results of the blend with mineral oils are shown in Figure 3.

(No. 1)

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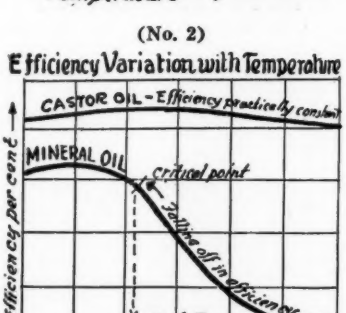


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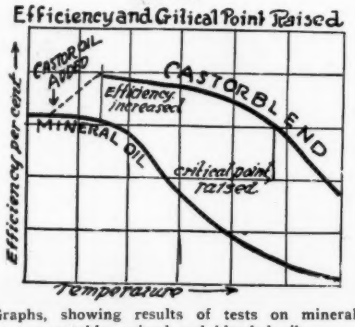



Graphs, showing results of tests on mineral, vegetable, animal and blended oils.

## Cisco Refining Company Is Latest Texas Concern

**Cisco, Texas.**—The Cisco Refining Company has been organized to acquire and operate the Eastland-Pioneer Oil Refining Company's 5000 barrel daily capacity skimming plant at Cisco. This plant was known as the Liberty Refining Company prior to its purchase in 1922 by the Eastland-Pioneer Oil Refining Company, and has been idle since March, 1923, when the latter company was placed in the hands of a receiver. The new owners have announced that the plant equipment will be worked over shortly and placed in operation, while a pipe line will be built from the plant to the Eastland field in Eastland County.

The officers of the Cisco Refining Company are: Walter K. Campbell of Tulsa, president; H. B. May of San Antonio, vice president and secretary; Edward M. Malpass, president of the Centennial National Bank, Philadelphia, Pennsylvania, treasurer. Douglas R. Nethery has taken charge of the plant and will also have charge of local sales of refined products, while H. B. May will market the balance of the output of the plant with headquarters at 715 Maverick building, San Antonio.

# BIGGS

## *For* Refinery

The Biggs Boiler Works Co. EST 1867 Akron Ohio

**Fractionating Towers or Columns**

**Dephlegmating Towers**

**Pressure Stills For Cracking Process**

**Steam Stills**

**Heat Exchangers**

**Crude Stills**

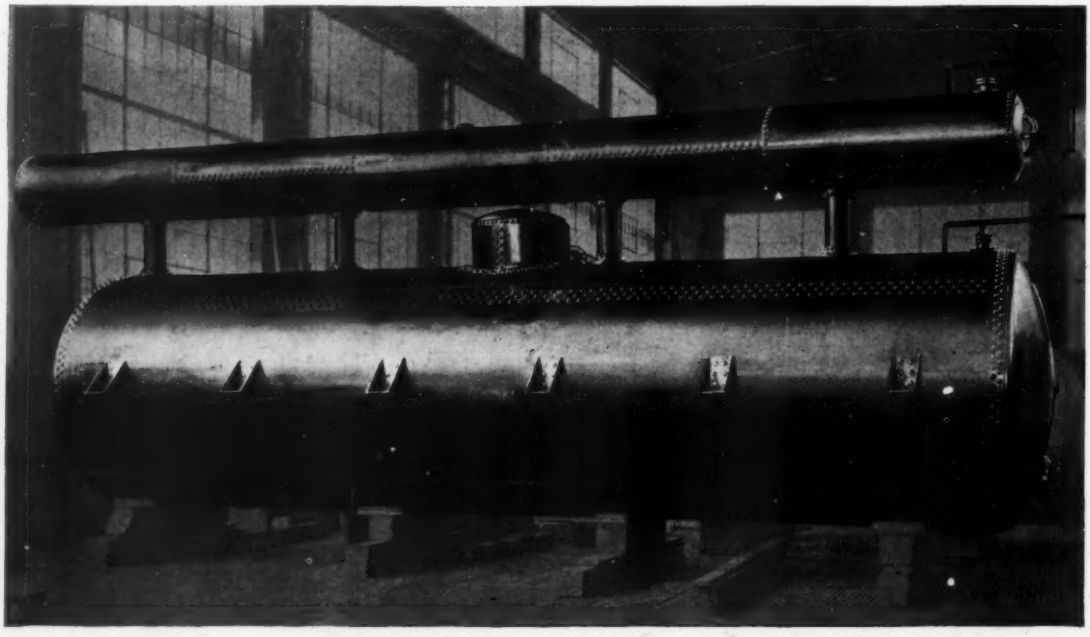
YOU know that every year you spend in the refinery busines teaches you some new wrinkles for turning out better prod ucts at lower cost.

The same thing holds true in tank construction. If you want rea value for your money—if you want tanks that will last and keep on lasting, look to the past record and experience of the maker.

Thirty-six years devoted to fabrication of high grade steel plate construction, has certainly taught us how to avoid the weaknesses that affect tank life.

Every year has marked a steady advance, both in knowledge of the

**MADE RIGHT—ALWAYS TIGHT**



Tell them where you saw the ad

# STANKS

## ry Equipment

The Biggs Boiler Works Co. Akron Ohio Est 1857

best manufacturing methods and in the respect of tank users everywhere.

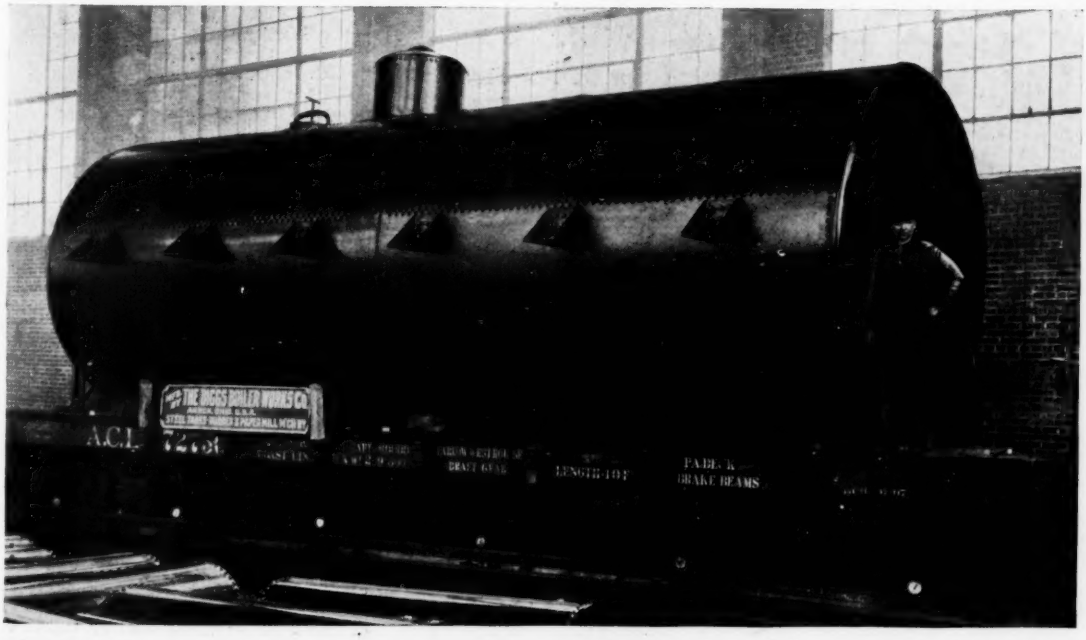
Through these years the keynote of Biggs policy has been "Accuracy". If you were to visit the Biggs Plant you would read this truth in every move of the skilled workmen—in the precision machinery, the up-to-the-minute handling equipment, the rigid tests, the careful selection of materials and other plant activities.

Safeguard your tank investment by dealing with a company whose methods as well as products have been thoroughly time tested.

Let Biggs engineers work with you on your next tank requirement.

**THE BIGGS BOILER WORKS COMPANY—AKRON, 42, OHIO**

**Condenser Boxes**
**Agitators**
**Run Down Tanks**
**Crude Storage**
**Blending Tanks**
**High Pressure and Accumulator Tanks**
**Direct Heat Driers Etc.**



### Getting the Most Out of Mexican Crude

(Continued from page 22)

through the purifiers at approximately the same rate.

In addition to the tests at the works a number of comparative "cracking tests" upon the Mid-Continent mixed gas oil and the relative tendencies of the oil to form oil gas, tar carbon, hydrogen sulphide, total sulphur, etc., and the relative contributions to the heating values of the finished gasses.

**Conclusions Concerning the Use of Mexican Gas Oil for the Manufacture of Carburetted Water Gas.**

The Mexican gas oil can be readily handled at temperatures about 60 F. but would no doubt have to be shipped in tank cars equipped with steam coils in cold weather as the oil practically ceases to flow at 21 F.

The Mexican gas oil contributes about 8000 more B.T.U. per gallon of oil used to the total heating value of the gas made than does the Mid-Continent gas oil.

The Mexican gas oil gives relatively little carbon deposit as compared to the other gas oils.

The Mexican gas oil gives no noticeable difference as compared to the Mid-Continent gas oil with regard to the yield of tar per gallon of oil used.

The Mexican gas oil while comparatively high in its content of sulphur, yields only 50 per cent increase in the $H_2S$ content of the crude gas as compared with the content in gas made from the Mid-Continent mixture which in this respect is believed to be fairly typical of the general average gas oils as used in conjunction with the average generator fuel.

The Mexican gas oil does not contribute an excessive amount of total sulphur to the finished carburetted water gas.

The Mexican gas oil apparently yields noticeably more oil gas per gallon of oil used than does the Mid-Continent mixed gas oil although somewhat lower than those by the better oils used.

The Mexican gas oil appears to yield as stable a gas as the Mid-Continent mixed oil. It must be admitted, however, that the Mid-Continent mixed gas oil used in these tests was not the best grade of gas oil obtainable.

**VARIOUS MEXICAN GAS OILS**

Gravity—32.6 Be.
Flash—170 F. P. A.
Burn—180 F. O. C.
Sulphur—1.5 per cent.
Coke—.7 per cent by weight.

**Distillation**

| | | |
|---|---|---|
| I. B. P. | 470 F. | |
| 10% | 520 | 39.3 Be. |
| 20 | 530 | 37.9 |
| 30 | 550 | 36.6 |
| 40 | 565 | 35.4 |
| 50 | 584 | 33.9 |
| 60 | 605 | 32.4 |
| 70 | 630 | 31.2 |
| 80 | 660 | 29.5 |
| 90 | 700 | 27.3 |
| Bottom 20.9 Be. | | |

**Gas Oil From Steam Still Bottoms**

Gravity—35.0.
Flash—156 F. P. A.
Sulphur—1.43 per cent.

**Gas Oil Test Made at Tower Stills**

Gravity—27.8 Be.
Flash—171 F. P. A.
Sulphur—2.35 per cent.
Pour—0 F.

A large gas oil yield may be had if desired by cutting from kerosene to wax tailings which will be about 54 per cent of the crude. The gas oil as stated before is entirely suited to gas making, or it may be run through cracking stills.

**Mexican Crude Run for Gas Oil**

| | |
|---|---|
| Crude naphtha (containing some kerosene) | 22.1% |
| Gas oil | 53.9 |
| Wax tailings | 2.00 |
| Coke | 16.0 |
| Gas and loss | 6.0 |

### Mexican Fuel Oil

Mexican Crude is largely used for fuel, the heavier grades are used in their natural condition and the lighter ones topped. Some of the largest railroad companies in the country use Mexican fuel with excellent results. Many steamship companies use this fuel as well as some of the large fighting ships of the world.

The fuels will vary in gravity from 11.0 Be. to 24.0 the latter probably mixed with gas oil at the refinery. Fourteen-sixteen gravity is the average gravity at which most of this fuel is used.

**Analysis of a Mexican Topped Crude**

Carbon—82.83 per cent.
Hydrogen—12.19 per cent.
Oxygen— .43 per cent.
Nitrogen—1.72 per cent.
Sulphur—2.83 per cent.
Calorific value 18,500 B.T.U.

Heavy fuel oil should be heated to its vaporizing point when being used, in order to obtain from it full heating value. Four barrels of Mexican fuel are equal to one gross ton of good bituminous coal.

Another factor in favor of Mexican fuel is that Mexican is heavier than most other fuel oils, and as oil is bought by the gallon or barrel the oil containing the most pounds per gallon


# "New Era" Absorber Trap

Is Not a Steam Trap

Designed expressly for Absorbers

Made in sizes to handle all the oil from Absorbers without the loss of any gas under any pressure and gravity and without any changes or adjustments.

These Traps do not become inoperative with oil and water.

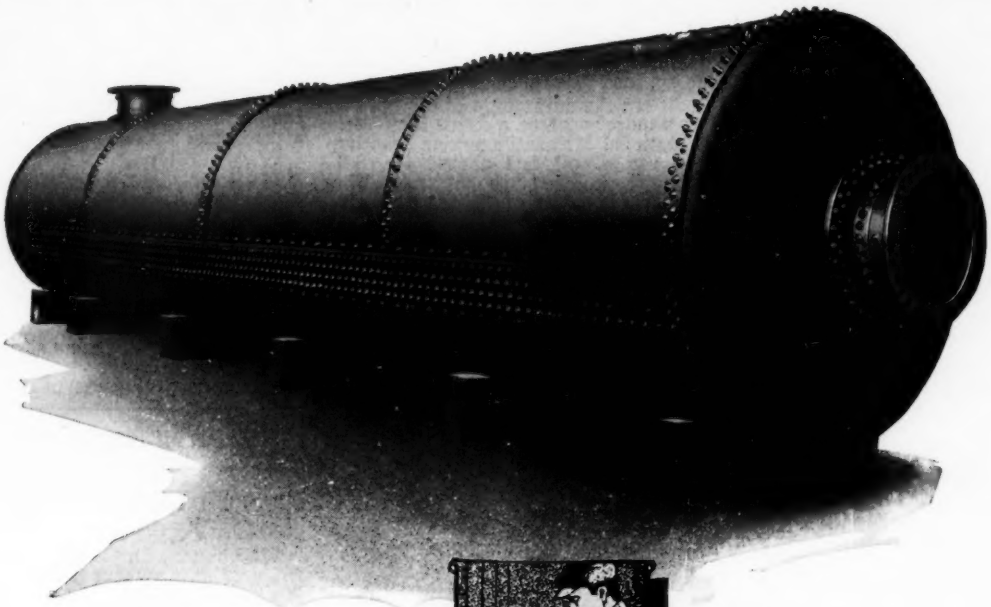
An absolutely new creation.

Sold with an unconditional guarantee

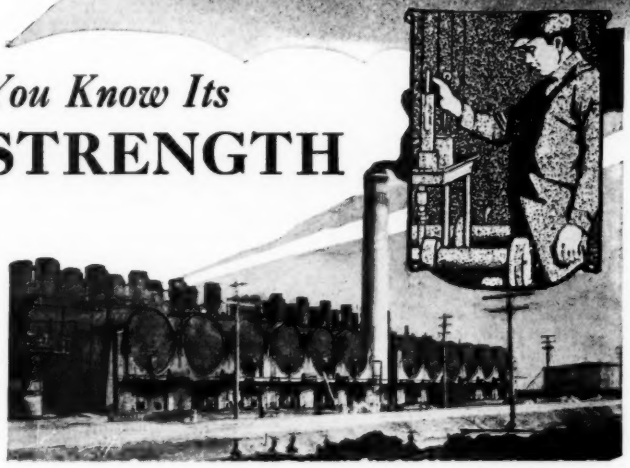
*Write us your needs*

**VALVE ENGINEERING COMPANY**

66-72 Hamilton Street, Cambridge, Mass.



*You Know Its*
**STRENGTH**



*Built by P. I. W. for the Standard Oil Company of Indiana*

P.I.W.
STEEL PLATE CONSTRUCTION

There is no "unknown quantity" about a P.I.W. Still. You know its strength, and you know how great it is, by figures and actual test.

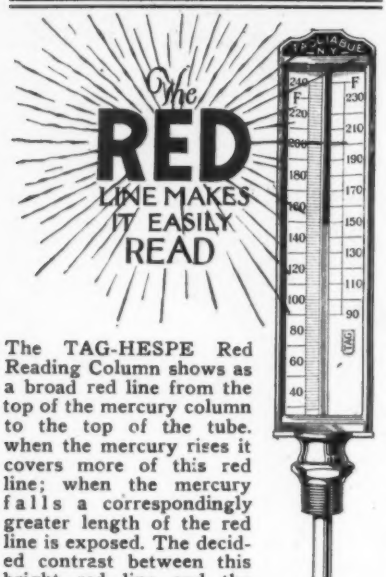
Consequently, you are sure of safety and longer life. And more, after long service you will have few repairs and no trouble making them.

*P. I. W. Stills give satisfaction*

**THE PETROLEUM IRON WORKS COMPANY**
**SHARON, PA.**

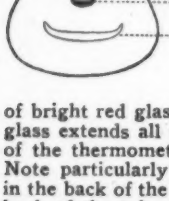
**New York St. Louis Houston Tulsa Casper San Francisco**

## *The TAG-Hespe Feature is applied to MERCURY Thermometers ONLY*




The TAG-HESPE Red Reading Column shows as a broad red line from the top of the mercury column to the top of the tube. when the mercury rises it covers more of this red line; when the mercury falls a correspondingly greater length of the red line is exposed. The decided contrast between this bright red line and the metallic grey of the mercury brings to the accurate mercury thermometer the easy readability of the red spirit instrument.

TAG-Hespe thermometer glass (tubing) is in every way similar to ordinary lens front thermometer glass except that in TAG-Hespe Glass the BACK of the fine capillary bore (up and down which the mercury travels) is made




A—Bore.
B—Red Glass.
C—White Glass.

of bright red glass. This red streak of glass extends all the way from the top of the thermometer down to the bulb. Note particularly that the red glass is in the back of the bore and NOT at the back of the tube (see cross section below).

The red line attracts the eye at first glance and it is easy to follow it down and take the reading at its bottom which is, of course, the top of the mercury column. The broad line of red stands out like a semaphore set at danger. You CAN'T miss it.

The TAG-Hespe Column is an EXCLUSIVE TAG feature. It is a RECENT improvement in thermometer manufacture which marks the greatest advance yet achieved.

Remember that the TAG-Hespe feature is applied to Mercury thermometers and that, therefore, there is no sacrifice of accuracy to attain this remarkable readability.

C. J. TAGLIABUE MFG. CO.
18-88 THIRTY-THIRD ST., BROOKLYN, N.Y.

*Insist on Mercury Thermometers with the TAG-Hespe RED Reading Column*

SINCE 1789

TAGLIABUE


will contain the most B.T.U.'s per gallon.

The advantages of oil fuel are many in all its applications, absence of soot and smoke, cleanliness of power plant, uniform control, reduction of fireroom force, ease of loading, and handling.

At sea the advantages of oil fuel are even more apparent, a report by the International Mercantile marine covering the use of oil fuel aboard the S.S. Olympic is of much interest. The Olympic is a ship of 46,439 tons register, her H.P. 50,000.

"The stokers or black squad and the grime and heat disappeared on the Olympic when oil fuel came into use. Even well established terms disappeared at the same time, for the former stoker is now known as a fireroom attendant. With coal as fuel this huge vessel carried no less than 246 firemen, who were shoveling incessantly in heat and coal dust to feed her fires

In hot weather conditions her firerooms were almost intolerable and not a day passed that did not see from 12 to 15 men pass under the ship's doctor suffering from heat exhaustion, burns, bruises, or physical breakdown incurred in the furious labor of feeding those insatiable, glowing, roaring furnaces.

With the installation of fuel oil all that changed as if by magic. In place of 246 men, comprising the black squad only sixty are now required to attend the oil burners. Scarcely a third of these men are on watch at any one time. They do not toil or sweat, but walk around a perfectly cool and well ventilated boiler room occasionally turning a valve or peeping at a fire through a small hole in the closed front of the firebox. One man attends twelve fires and does it easily.

Three hundred men were required to coal the "Olympic" each trip, and they worked from four to four and one-half days. Now the ship can be bunkered in eight hours with the labor of only ten men, and while the fueling is in progress other work aboard ship is not interrupted.

The amount of oil burned by the Olympic on a voyage of 3,000 miles from New York to England is about 3,600 tons or about 600 tons per day.

The ship's consumption of coal was from 840 to 920 tons daily. When burning coal the total bunker capacity was 7,577 tons, giving the ship a steaming radius of about 5,000 miles at twenty knots, and 4,350 miles at twenty-one knots. Conversion to oil released some 1,000 tons of space for cargo in the old bunkers, the steaming radii have been slightly increased. The following comparison between coal and oil gives approximate figures.

| 21 knots | Coal | Oil |
|---|---|---|
| Miles per ton . . . . . | .57 | .85 |
| Pounds per 1 h.p. per hour . . . . . | 1.64 | 1.12 |
| No. men required in fireroom . . . . . | 240 | 60 |
| Time req'd for fueling. | 4½ days | 8 hours |

In tug-boat service fuel oil is used to great advantage, it being said that two oil fired tug boats will take the place of three tugs of the same size, power, and having all other conditions the same as where using coal as fuel.

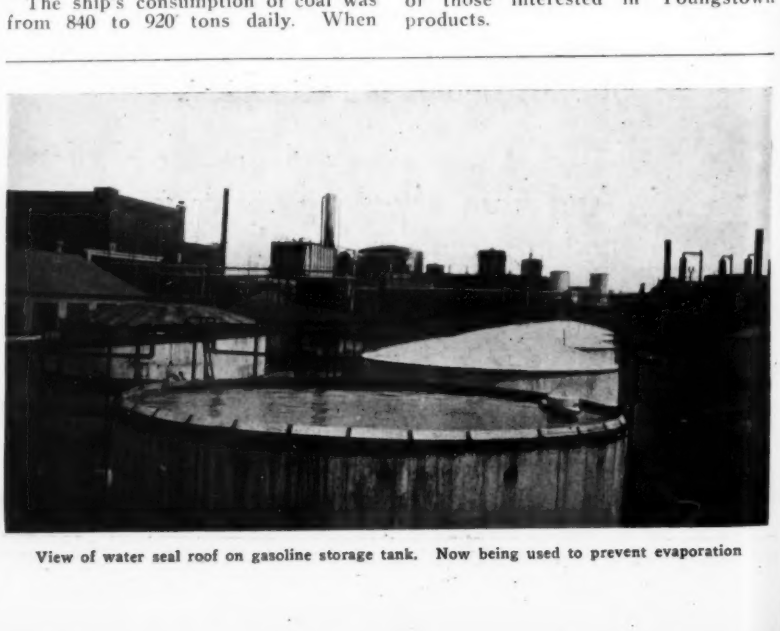
*To be concluded in next issue.*

## Research Work to Be Done On Tonkawa Development

**Washington, D. C. Jan. 28. —** The study of development problems in the Tonkawa oil field in Oklahoma has been completed by engineers of the Department of the Interior attached to the Bartlesville, Oklahoma, station of the Bureau of Mines. The peg model of this field, which was exhibited at the recent International Petroleum Exposition and Congress, held at Tulsa, Oklahoma, has been shipped to Tonkawa and placed on exhibition there by the Tonkawa Chamber of Commerce.

## Keene Thrusts to Come From Youngstown Monthly

Youngstown Boiler & Tank Company has recently published the first issue of its house organ. The name of this publication is "Keene Thrusts." As a sample of what the booklet is to contain the following is a head used on an article printed in the first issue: "Out Where the West Begins; Where the Mud's Deep as Hell and Oxen Grunt." The publication is to be for the benefit of those interested in Youngstown products.



View of water seal roof on gasoline storage tank. Now being used to prevent evaporation

# LETTERS TO THE EDITOR

Referring to an article published in the January issue on a method used by one refining concern for testing paints before making purchases, a subscriber of The REFINER AND NATURAL GASOLINE MANUFACTURER writes in to take exception at the editor's note accompanying the article.

This reader states that the method referred to in the article is the only one that can be used, which will furnish the buyer with the proper knowledge of paint maintenance and quality, before making purchases.

The letter follows:

Editor,
Refiner & Natural Gasoline Manufacturer,
1716 Dallas Ave.,
Houston, Texas.
Gentlemen:

I have naturally been interested in the article on page 27 of your January 1924, issue wherein your A. R. McTee describes the method used by the Humble Oil and Refining Company for testing paints but fail to understand why editorial comment was necessary, particularly when the editorial comment contains criticism of this method. I am forced to the conclusion that this comment was prompted solely by lack of knowledge of the problems facing the refiners in this section in paint maintenance.

For your information, paint manufacturing companies who have given serious consideration to the conditions governing the failure of paints in the Gulf Coast territory have found that materials giving excellent service here will fail elsewhere.

Carrying this question a little further it has been found that although paint made on a particular formula gives excellent service in a refinery on the Gulf Coast, the same formula may fail and has frequently failed in other refineries in the same section, although of course it would be a basis for studying paint failures in the other refineries.

Eliminating the known differences in the types of crude oil used, methods of refining, methods of treating, and methods of application, there still remain a number of peculiarities which require not only careful study of the chemistry of the situation but after exhausting all of the information apparently available there still remains considerable experimenting to be done before the best results may be obtained. The methods of testing paints employed by the Humble Refinery is positive and in addition saves them the cost of applying material an a large scale, at the same time giving the paint companies an opportunity to demonstrate what their materials will do. It is of advantage to the paint companies also, in that it gives them the opportunity of finding out how their paints fail under actual refinery exposure and the only real method of learning how to make better paint is by observing how known formulae fail.

A smooth line of talk may convince a purchasing agent or refinery superintendent that he should buy some paint but in view of the fact that no reputable paint concern sells their paint with any definite guarantee of service, and that it cost the refinery more in labor to apply his paint than the material costs, isn't if far more economical to try out the comparative values of any paint under the actual conditions for which it is purchased before spending money to buy paint and more money to apply it when a little investigation will show that a large per cent of the paint offered for sale, on which great claims are made by the salesmen, are absolutely unsuited for the particular service and will not give reasonable life?

What is more proper than that a refinery continue to use the material which gives a known service until it is proven in that particular refinery without any appreciable expense that more economical service can be had from some other material? I am sure that had you investigated the results of these tests and compared them with the claims made by manufacturers of the service these various paints have given on other plants, you would not have written an editorial on this article but would agree with them that the only safe way to approach an oil refinery paint problem in the Gulf Coast territory is for the paint companies to get permission to apply or have applied a number of these tests in which the best material for that particular refinery would be readily apparent and then bring on the selling talk which would be based only on demonstrated facts and quoted prices.

Yours very truly, ——

## Good Performance Record For Large Gas Engines

W. J. Godfrey

**Branchland, W. Va.**—A new non-stop station record for large gas engines has been made by W. J. Godfrey, station engineer in the Branchland station of Columbia Gas and Electric Company.

This record was made with eight Cooper 485 H. P. gas engines.

All the engines were started on September 14, 1922. Below is a record of their performance:

| Eng. No. | Days Cont. Run | Reasons for shut down |
|---|---|---|
| 1 | 222 | General adjustment |
| 2 | 236 | General adjustment |
| 3 | 205 | Compressor Crosshead |
| 4 | 103 | Compressor Crosshead |
| 5 | 262 | Pipe line repair |
| 6 | 245 | Water leak |
| 7 | 262 | Pipe line repair |
| 8 | 242 | Water leak |

In making this record, no attempt was made to punish the engines. When the smallest adjustment was necessary, the engine was stopped. The two oldest engines have been in operation in this station for nine years.

Much credit is given W. J. Godfrey, under whose direction the record has been established. However, he says, "No engine but a Cooper could last on a job like ours."

## Refiners Get Ready for Big March Meeting

(Continued from page 11)

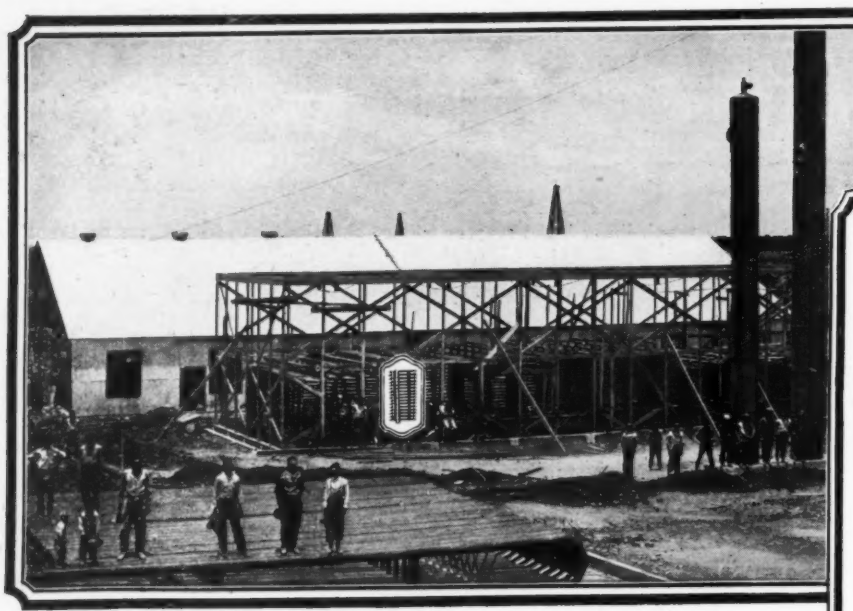
of Tulsa, Cosden & Company; F. A. Pielsticker of Eldorado, Kansas, Skelly Oil Company; O. D. Robinson of Pittsburgh, Pennsylvania, Transcontinental Oil Company; W. O. Schock of St. Louis, Indiahoma Refining Company; Frank M. Smith of Dallas, Oriental Oil Company; J. L. Walsh of Mutual Oil Company; W. M. Welch of Tulsa, Tidal Refining Company; K. L. Wickett of Chicago, Sapulpa Refining Company; G. G. Woodruff of St. Louis, Roxana Petroleum Corporation, and H. B. Earhart and W. E. MacEwen.

Members of the executive committee are Geo. N. Moore, P. M. Miskell, Roy B. Jones, W. L. Kistler, H. T. Ashton, D. E. Buchanan, S. C. Collins, Elliott Jones, Geo. D. Locke, E. R. Perry and F. A. Pielsticker.

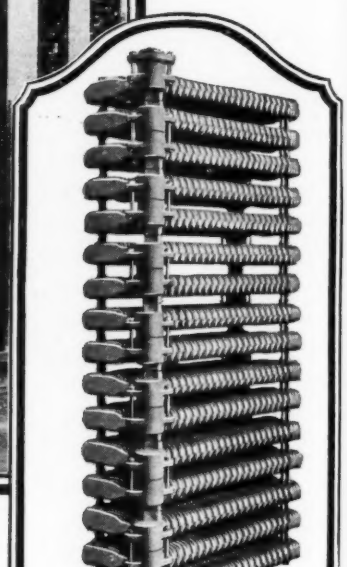
H. G. Roe of Cosden & Company of Tulsa is chairman of the transportation committee of the association and is in charge of arrangements for handling the refiners going to and coming from the convention. Refiners are expecetd from New York, Chicago, Pittsburgh, Cleveland, St. Louis, Denver, Wichita, Eldorado, Kansas; Oklahoma City, Shreveport, New Orleans, Fort Worth, Wichita Falls, Ardmore, Okmulgee, El Dorado, Arkansas, San Antonio, Houston and from Tulsa. Arrangements are in progress for routing the refiners from cities north and east of Tulsa through Tulsa and to operate a special train from here to Dallas. This plan is only tentative, however.

A part of the entertainment program will be given over to a reception and dance and other features for the entertainment of the refiners will be arranged. The entertainment committee who has this work in charge is made up of Roy B. Jones of Wichita Falls, Elliott Jones of San Antonio and W. B. Hamilton of Wichita Falls.

Reservations already made at the Adolphus Hotel in Dallas indicate a large attendance at the first day of the convention.



Ibex Plant of Landreth Gasoline Company—52,000 square feet of Sterling Oil Condensing Sections. Seeley-Oberfell, Consulting Engineers



Sterling Oil Condensing Sections as assembled in stacks

# Another Absorption Plant Installs Sterling

THE Landreth Gasoline Company of Breckinridge, Texas, whose Ibex Plant is shown under construction, is another plant added to the long list of those who have installed Sterling Condensing Sections—52,000 square feet.

Wherever coils have been used in your plant, Sterling Sections can be used more effectively and economically.

Whether used as pre-coolers for handling high temperature gas before it goes to the compressors, as coolers after the gas leaves the compressors, as condensers after the distillate leaves the still or as coolers for the lean oil on its way back to the tower, Sterling Sections are superior to coils in every respect.

Let our engineer call and tell you how Sterling Sections will do your work.

An attractive eight-page illustrated booklet tells the complete story of Sterling Sections. Send for a copy.

**Sterling Sections are effective because**

- —they condense more rapidly than coils
- —it is easier to maintain permanent low end temperatures
- —they reduce receiving house temperatures (as much as 10°)
- —distillate always runs cool into tail house
- —back pressure is eliminated.

**Sterling Sections are economical because**

- —they are cheaper to install than coils
- —they require less support
- —spray pits and boxes will carry twice as much condensing surface
- —they have a much longer life than coils
- —they are easier to get at or remove for cleaning, repair or replacement.

# AMERICAN RADIATOR COMPANY

*IDEAL Boilers and AMERICAN Radiators for every heating need*

**Industrial Sales Offices: 1807 Elmwood Ave., Buffalo, N.Y.**

**Sterling Condensing Sections are Manufactured in Kansas City, Mo.—Springfield, Ohio—Buffalo, N.Y.**

# PERSONNEL OF THE INDUSTRY

Lacy Walker succeeds L. M. Fanning as director of statistics and publicity for the American Petroleum Institute with headquarters in New York.

E. W. Marland, head of the Marland Refining Company, of Ponca City, Oklahoma, in company with other oil men, is on a cruise in the Gulf waters.

H. T. Ashton, general manager of the Lubrite Refining Company, was away from his offices in St. Louis recently on a business trip to the Mid-Continent refining section.

Roy B. Francis, sales manager of the Pure Oil Company, is absent from his Columbus, Ohio, headquarters and is recuperating in Florida.

George F. Brigham of Tulsa, district manager of the North American Car Company, was a visitor in St. Louis refining circles the latter part of January.

A. B. BROOKS,
Member of the board of directors of the Standard Oil Company of California, one of the largest refining concerns in the world. Mr. Brooks is in direct supervision of the purchasing division.

John G. McCaskey, 48, senior member of the McCaskey-Wentz Oil Company, producers, refiners and natural gasoline manufacturers, died at Pittsburgh, Pennsylvania, January 12.

Harry F. Sinclair, chairman of the board of Sinclair Consolidated, is in Europe and expects to return to the United States in February.

Dean E. Foster, president and treasurer of the Foster and Bowles Corporation of Tulsa, recently completed a tour of North Texas and Southern Oklahoma points.

R. E. Clark has been appointed assistant secretary and assistant treasurer of the Standard Oil Company (Indiana), succeeding S. S. Gano who has retired.

J. J. Traft has resigned as plant superintendent of the Globe Oil and Refining Company of Blackwell, Oklahoma, and intends to enter business for himself.

R. O. Stull, general purchasing agent for the Panhandle Refining Company, has resigned to accept a similar position with the American Refining Company, which maintains headquarters at Wichita Falls and has a refinery and natural gasoline plant in addition to a pipe line system and its own producing properties.

J. A. LaFortune, assistant secretary of the Mid-Continent Oil and Gas Association, now is associated with the Warren Petroleum Company of Tulsa with offices in the First National Bank building.

J. T. Edwards, former secretary and treasurer of the Oklahoma Oil Jobbers Association, has removed to Omaha, Nebraska, to become assistant superintendent of the lubricating department of The Texas Company.

George N. Rice, general manager of the Nyanza Refining Company of Wilson, Oklahoma, was killed January 8 by an explosion of a still at the refinery.

W. A. Schlueter, district manager of C. J. Tagliabue Manufacturing Company, left his headquarters in Tulsa the latter part of January on a business trip to southern points.

H. T. Horton of the Chicago Bridge and Iron Works, is on a business jaunt through the Rocky Mountain territory. He is making Casper his headquarters on this trip.

Clinton G. Armstrong has been appointed sales engineer for the Calorizing Company, with headquarters in Chicago. Mr. Armstrong was formerly consulting metallurgist for the Chicago Flexible Company.

C. M. Ricketts, sales manager for the Caddo Central Oil & Refining Corporation with headquarters at Shreveport, Louisiana, recently visited old friends and acquanitances in the North Texas refining centers.

George C. Jehle, assistant district manager of the Indian Refining Company with headquarters at Kansas City, Missouri, made a recent tour of the refining centers in Oklahoma and North Texas.

H. L. Clears of the Walworth Manufacturing Company, who has been located at Kewanee, Illinois, now is representing the company in the Rocky Mountain territory with headquarters at the Frick-Reid Supply Company at Casper, Wyoming.

G. C. Jensen, President of the Sunshine State Oil & Refining Company with headquarters at Wichita Falls, Texas, departed for the East during the last week in January on a two-week business trip.

Roy Mann, formerly assistant general purchasing agent for the Panhandle Refining Company at Wichita Falls, Texas, has succeeded R. O. Stull as purchasing agent following the latter's resignation in January.

O. H. Berryman, general manager in charge of the Interstate Gasoline Company's refinery and natural gasoline plant near Wichita Falls in North Texas, was a business visitor in Tulsa recently.

## GUYTON & CUMFER CATALOG

Catalogue 101 has just been issued by the Guyton & Cumfer Manufacturing Company, 4451 Fillmore street, Chicago, descriptive of their line of steam jacketed pumps and fittings. Aside from reproductions of the finished products, drawnings are reproduced to give details of construction.

Prices are listed on one page, being revised to date. Instructions for installing the products are contained in the catalogue, which is available from the concern.

# 16~160 h.p. "WESTERN" GAS ENGINES in this plant

"Western" Oil Field Engines
25-40 H.P.

"Western" Gas Engines
80-320 H.P.

To be skeptical of the possible accomplishment of any mechanical equipment is an attitude of mind not frequently encountered in this age of almost superhuman progress. And yet, the hard-headed policy of efficient business demands of the capable executive that he "know" and not trust to hearsay, circumstantial evidence, or mere recommendation.

"Western" commends and invites this attitude of rigid investigation on the part of executives who are responsible for efficiency and costs, and the extraordinary ability of "Western" Engines to produce records in actual service which defy comparison, have convinced many of these men and companies that genuine efficiency and economy are more essential from a dollars and cents standpoint than a "policy" without a rock-ribbed foundation.

Performance is what counts. Absolute knowledge resulting from personal investigation is a safe and sure basis for comparison and selection. What we tell you about "Western" Engines are facts, and they are interesting, but it is what these engines do out on the job, fully backing up what we say of them, that so often has changed the complete power policy of some of the largest companies, as well as some of the smallest, in the industry.

It is easy to KNOW that "Western" Engines are superior, as it is to think so, for "Western" invites the most thorough investigation and rigid comparison.

## WESTERN MACHINERY COMPANY

General Offices and Factory: 903 North Main Street.
Los Angeles, California, U. S. A.

San Francisco California | Bakersfield California | Tulsa Oklahoma | Okmulgee Oklahoma

## A PART of over 100 such units used by 1 Company

*A Single "Western" Engine Frequently has Changed the Complete Power Policy of an Entire Company.*

# RECENT REFINERY PATENTS ISSUED

BY STAFF REPRESENTATIVE

**Washington, D. C.** — The following patents of interest to the oil refining industry have recently been issued by the United States Patent Office at Washington:

**No. 1,479,653,** issued on January 1 to Joseph G. Davidson, assignor to Charles H. Conner, New York, N. Y., on a method of cracking oils. The method comprises immersing in a relatively large body of oil a plurality of resistors of massive construction connected with sources of poly-phase alternating current and heating the oil by means of such resistors to the cracking temperature and pressure.

The method comprises immersing in a body of the oil massive electric resistors heated by alternating current to the cracking temperature, and periodically removing the carbon deposit from said resistors without removal thereof from the still.

**No. 1,479,776,** a patent on an apparatus for cracking and distilling oils, issued on January 1 to Joseph G. Davidson, assignor to Charles H. Conner, New York, N. Y. The apparatus comprises a still adapted to contain a relatively large body of oil, one or more massive electrical resistors therein arranged to be submerged in the body of oil, and means for supplying polyphase alternating current to said resistors.

An apparatus for cracking and distilling oil, comprising a still adapted to contain a relatively large body of oil, one or more massive electrical resistors therein adapted to heat the oil, and means within the still for removing deposited carbon from the resistors from time to time.

**No. 1,479,833,** on a method of refining oils, issued on January 8 to William J. Reilly, Denver, Colorado. The patent covers a method of converting oils of high specific gravity into oils of lower specific gravity which comprises passing the oil into a distilling chamber, mixing the same with vapors heated to the temperature required to maintain conversion passing the mixed oil and vapor through a helical passage at the pressure necessary to maintain conversion whereby they become thoroughly intermingled, passing the intermingled oil and vapor into a chamber containing a catalytic agent passing said intermingled oil and vapor through another helical passage, expanding the mixture into a vapor chamber, separating the undecomposed particles from the vapor and condensing the vapor under any desired pressure less than that under which the distillation takes place.

**No. 1,480,045,** issued on January 8 to Clifford P. Bowie, Berkeley, California, and Martin J. Gavin, Boulder, Colorado, on an apparatus for treating hydrocarbon-containing materials. The apparatus comprises a retort to which the material to be treated is supplied; an underlying heating hearth upon which the base of the retort rests; a conduit leading from the peripheral region of the hearth for the discharge of the residual material; offtakes from the retort for the vaporous material; revolving disc-rabble gangs operating over the hearth for mixing the material being treated and directing it outwardly; scrapers associated with the rabble gangs at their outer extremities to deliver the residual material to the discharge conduit; and means for heating the hearth to a temperature increasing from the central region outwardly.

**No. 1,480,064,** a patent for an electric dehydrator, issued on January 8 to Ford W. Harris, assignor to Petroleum Rectifying Company, of California, San Francisco, California, a corporation of California. The patent is on a method

PIONEER TANK & BOILER COMPANY

A New Name for an Old Friend

WHAT'S in a name, anyway? The refinery construction work we are doing under the name "Pioneer" is just the same high grade as when it bore the name "Tulsa Boiler and Sheet Iron."

For eighteen years, as the "Tulsa Boiler and Sheet Iron Works" we have turned out tanks and refinery steel construction that made good friends for us among the wise buyers of the Mid-Continent. We pioneered in giving these people "close to home" service on the best kind of work.

Now, under the new name, The Pioneer Tank and Boiler Company, we're all set with the men, machinery and money to keep on growing under the Pioneer banner like we did when Tulsa Boiler and Sheet Iron was on our letterhead.

There is no change in our organization.

Get Pioneer quotations on tank and refinery construction work.

PIONEER TANK & BOILER COMPANY
(Formerly Tulsa Boiler and Sheet Iron Works)
Box 1926, TULSA, OKLA.

Established 1867

The Vilter Manufacturing Co.

1152-1162 CLINTON ST., MILWAUKEE, WIS.

Vilter High Speed Horizontal Refrigerating Machine

Builders of Refrigerating Machinery, Oil Cooling Coils, Gasoline Condensers, Etc.

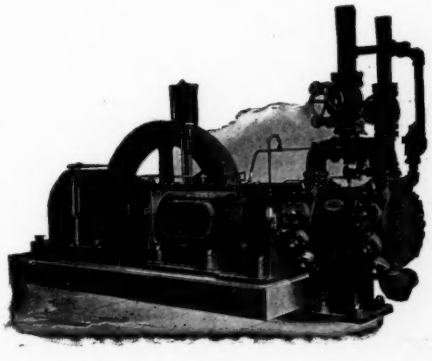
Vilter Equipment is used in many of the oil refineries.

Vilter-Milwaukee typifies the true standard of reliability in machinery construction and refrigerating engineering.

Vilter Low Temperature Compression System (for efficiently producing low temperatures with compression system.)

Vilter Sales Engineers always at your service.

Branch offices in all the principal cities.



XUM

of dehydrating petroleum emulsions which comprises: establishing an electrostatic field between electrically charged surfaces immersed in an insulating fluid of sufficient dielectric strength to prevent disruptive discharges between said surfaces; and passing the emulsion to be treated through said field in such a manner that the envelope of insulating fluid around one of said electrodes is unbroken and the dielectric strength is maintained at a value sufficient high to prevent disruptive discharge.

**No. 1,480,091,** a patent on a dehydrator, issued on January 8 to Wynn Meredith, assignor to Petroleum Rectifying Company, San Francisco, California, a corporation of California. It relates to a process of agglomerating water particles from an emulsion which comprises forcing the emulsion upwardly in a series of fine jets through a loosely held mass of comminuted material.

**No. 1,480,808,** issued on January 15 to Kork Kelley, assignor of one-half to Thomas L. Kerr, Bartlesville, Oklahoma. The patent relates to the production of liquid motor fuels, and describes the method of making a hydro-carbon oil which includes distilling casinghead gasoline, fractionally distilling kerosene, commingling the distilled vapors, and condensing the commingled vapors.

**No. 1,481,525,** issued on January 22 to William W. Nugent, Chicago, Illinois, on an oil-purifying mechanism. It is a filter element comprising a frame formed in two parts and secured together, one of the parts having an overflow opening below its top edge; a filter bag having its top edge clamped between the parts of said frame; and points on one of the parts engaging the top portion of the filter bag preventing displacement of the bag from between said parts.

## Another Absorber Added To T. P. West Texas Plant

**Breckenridge, Texas.** — Another absorber is being added to the Texas Pacific Coal & Oil Company's natural gasoline plant on the A. S. Veale farm, section 1423, and near Caddo in Stephens County, to make use of the additional gas now available on nearby leases as result of the completion of new wells. The absorption process is used in this plant, and the new equipment will bring the daily capacity up from about 12,000,000 cubic feet to 14,000,000 cubic feet. H. A. Sting is the superintendent in charge of this plant.

*Announcing the Organization of the*

# Foster & Bowles Corporation

*Consulting, Manufacturing and Operating Engineers*

DEAN E. FOSTER
President and Treasurer

JOHN S. BLAIR
Secretary

CHARLES E. BOWLES
Vice President and General Manager

This business, founded by Mr. Foster, and conducted under the name DEAN E. FOSTER, has been incorporated as the FOSTER & BOWLES CORPORATION and moved to larger quarters in the Wright building. The scope of work will be much broadened, especially along the line of plant construction and operation and the manufacture of specialty equipment for gasoline plants and use in the oil fields.

The aggregate experience of the men in the organization includes years of practical training in every phase of gasoline plant design, construction and operation from an engineering standpoint, as well as the handling of plants from a business standpoint as money-makers on invested capital. The corporation is specializing on the conversion of compression plants to oil absorption.

**FOSTER & BOWLES CORPORATION**

**WRIGHT BUILDING** **TULSA, OKLAHOMA**

# Mid-Continent Refinery Operations

AS OF JANUARY 1, 1924

### ARKANSAS

| Plant and Location— | Capacity | Now running |
|---|---|---|
| Abner Davis, El Dorado | 60 | SD |
| Airedale Ref. Co., El Dorado | 1,000 | SD |
| Arkansas Ref. Co., Fort Smith | 1,000 | SD |
| Arkansas P. & R. Co., El Dorado | 1,000 | SD |
| El Dorado P.L.&R. Co., El Dorado | 2,000 | SD |
| Farmer Oil & Ref. Co., Texarkana | 1,000 | 400 |
| Four States Ref. Co., Texarkana | 400 | SD |
| Griscon Ref. Co., El Dorado | 750 | SD |
| Jones Bros. & Tatum, El Dorado | 1,000 | SD |
| Kettle Creek Ref. Co., Pearson | 2,000 | 3,300 |
| Lion Oil & Ref. Co., El Dorado | 12,000 | 7,000 |
| Newark Ref. Co., El Dorado | 1.500 | SD |
| Pine Bluff Ref. Co., Pine Bluff | 1.500 | 700 |
| Root Refineries, El Dorado | 3,000 | 1,750 |
| Shippers Pet. Co., El Dorado | 1.800 | SD |
| The Arkansas Ref. Co., Picron | 3,000 | SD |
| Union Pipe Line & Ref. Co., El Dorado | 4,000 | * |
| Total for Arkansas | 36,960 | |

### KANSAS

| | | |
|---|---|---|
| Associated P. & R. Co., Eldorado | 1,000 | SD |
| Bell P. & R. Co., Eldorado | 700 | SD |
| Commonwealth O. & R. Co., Moran | 800 | 600 |
| Derby Oil & Ref. Co., Wichita | 5,000 | 3,600 |
| Chem. Oil & Gas Co., Osawatomie | 1,000 | SD |
| Eldorado Ref. Co., Eldorado | 4,000 | 2,000 |
| Gibraltar Ref. Co., Hutchinson | 2,000 | * |
| Golden Rule Ref. Co., Wichita | 800 | 800 |
| Great Western Pet. Co., Florence | 2,000 | SD |
| Great Western Ref. Co., Erie | 1,500 | SD |
| Industrial Ref. Co., Eldorado | 1,500 | 600 |
| Kanotex Ref. Co., Arkansas City | 3,000 | 4,500 |
| Kansas City Ref. Co., Kansas City | 5,000 | 4,500 |
| Kansas Oil Ref. Co., Coffeyville | 2,000 | SD |
| Kansas-Texas Oil Ref. Co., Wichita | 1.500 | SD |
| Interstate Ref., Inc, Centropolis | 1,600 | SD |
| Lesh Ref. Co., Arkansas City | 1,500 | SD |
| The Grant Oil Co, Augusta | 2,500 | 700 |
| Skelly Oil Co., Eldorado | 12,000 | 8,000 |
| Mutual Oil Co., Chanute | 1.500 | SD |
| Mecca Ref. Co., Augusta | 2,500 | SD |
| Marshall & Co., Sheffield | 2,500 | SD |
| Moore Ref. Co., Arkansas City | 4,500 | 2,400 |
| McCree Pet. Co., Baxter Springs | 600 | SD |
| McWhorter-Chanute Ref. Co., Chanute | 200 | SD |
| Miller Pet. Co., Humboldt | 1,500 | 1.400 |
| National Ref. Co., Coffeyville | 5,000 | 5,000 |
| North Amer. Ref. Co., Rosedale | 700 | SD |
| Peerless Oil & Ref. Co., Chanute | 3,000 | 2,000 |
| Roxana Pet. Co., Arkansas City | 10,000 | 7,000 |
| Richardson Ref. Co., Eldorado | 2,000 | 600 |
| Red Bird Ref. Co., Fredonia | 800 | 200 |
| Sinclair Ref. Co., Argentine | 6,000 | 6,500 |
| Sinclair Ref Co., Coffeyville | 7,000 | 7,000 |
| Sterline Oil & Ref. Co., Wichita | 5,000 | 2,500 |
| Standard Oil Co. (Kansas) Neodesha | 12,000 | 10,000 |
| Uncle Sam Oil Co., Argentine | 700 | SD |
| Uncle Sam Oil Co., Cherryville | 2,400 | SD |
| Vickers Pet. Co., Potwin | 1,800 | 1,400 |
| White Eagle O. & R. Co., Augusta | 6,500 | 7,000 |
| Total for Kansas | 117,200 | |

### LOUISIANA

| | | |
|---|---|---|
| Caddo Central Oil & Ref. Co., Shreveport | 3,500 | 8,000 |
| Caddo Central Oil & Ref. Co., Shreveport | 7,000 | |
| International O&G Co., C'd'r Spgs. | 800 | SD |
| Homer Refining Co., Homer | 250 | SD |
| Leeton Ref. Co., Shreveport | 1,000 | SD |
| Louisiana Pet. Prod. Co., Bossier | 8,000 | SD |
| La. Oil & Ref. Co., Shreveport | 6,000 | 6,000 |
| Red River Ref. Co., Crichton | 1,800 | SD |
| Paramount Pet. Co., Superior | 3,000 | SD |
| Rogers Refining Co., Shreveport | 1,500 | SD |
| Shreveport Oil & Ref. Co., Shreveport | 4,500 | 3,500 |
| Tar Island Ref. Co., Mooringsport | 300 | SD |
| The Texas Co., Arlda | 5,000 | 5,000 |
| Union Ref. & P. L. Co., Oil City | 1,000 | SD |
| Union Ref. & P. L. Co., Homer | 1,000 | SD |
| Total for Louisiana | 48,650 | |

*Re-running.

### MISSOURI

| Plant and Location | Capacity | Now running |
|---|---|---|
| Wilhoit Ref. Co., Joplin | 2,000 | 1,200 |
| Standard Oil Co., Sugar Creek | 15,000 | 15,000 |

### OKLAHOMA

| | | |
|---|---|---|
| Acme Ref. & P. L. Co., Jennings | 2,600 | SD |
| Allied Ref. Co., Okmulgee | 2.000 | 1,000 |
| Associated P. & R. Co., Yale | 1,000 | SD |
| Barnsdall Ref. Co., Barnsdall | 3,000 | 3,500 |
| Bay State Ref. Co., Healdton | 1,000 | SD |
| Beaver P. & R. Co., Dilworth | 700 | SD |
| Big Six Ref. Co., Sapulpa | 3,000 | SD |
| Bison Ref. Co., Quay | 1,000 | SD |
| Blue Ribbon Ref. Co., Walters | 500 | SD |
| Belene Ref. Co., Enid | 3,600 | 4,500 |
| Bristow Gaso. & Sup. Co., Bristow | 1,200 | 1,200 |
| Buffalo Ref. Co., Yale | 1,000 | SD |
| Cushing Ref. Co., Cushing | 1,000 | 1,500 |
| Cameron Ref. Co., Ardmore | 3.500 | 2,700 |
| Canfield Ref. Co., Yale | 500 | 50 |
| Carter Oil Co., Cartoco | 12,000 | SD |
| Champlin Ref. Co., Enid | 14,000 | 5,000 |
| Chestnut & Smith Corp., Sand Springs | 5,000 | SD |
| Chas. F. Noble Oil & Gas Co., Oklahoma City | 2,000 | SD |
| Coleman-Nelson Corp., West Tulsa | 2,000 | 400 |
| Coleman-Nelson Corp., Haskell | 1,000 | SD |
| Constantin Ref. Co., Devol | 10,000 | SD |
| Constantin Ref. Co., West Tulsa | 4,500 | SD |
| Cosden & Co., West Tulsa | 35,000 | 25,000 |
| Cushing R. & G. Co., Blackwell | 12,500 | 600 |
| Anderson & Prichard Oil Corp., Oklahoma City | 800 | 600 |
| Daisy Bell Pet. Co., Wilson | 2,000 | 200 |
| Damascus Ref. Co., Lawton | 1,500 | SD |
| El Dorado Ref. Co., Yale | 700 | SD |
| Equality Ref. Co., Oilton | 1,000 | SD |
| Empire Refineries, Inc., Cushing | 5,000 | 3,000 |
| Empire Refineries, Inc., Okmulgee | 2,500 | 2,000 |
| Empire Refineries, Inc., Okla. City | 2,500 | 3,000 |
| Empire Refineries, Inc., Ponca City | 4,500 | SD |
| Francis Ref. Co., Francis | 5,000 | SD |
| Frederick Ref. Co., Frederick | 5,000 | SD |
| Fairmont Ref. Co., Fairmont | 2,500 | SD |
| Federal Oil & Ref. Co., Cushing | 1,500 | SD |
| Globe Oil & Ref. Co., Blackwell | 4,000 | 1,200 |
| Gilmer Oil Co., Ringling | 800 | SD |
| Golden Belt Ref. Co., Okla. City | 200 | SD |
| Grandfield O. & R. Co., Grandfield | 3,000 | SD |
| Hewitt Ref. Co., Hewitt | 1,600 | 900 |
| Home Oil & Ref. Co., Yale | 2,000 | SD |
| Indian Chief Ref. Co., Cushing | 1,800 | SD |
| Loraine Pet. Co., Bristow | 2,500 | 1,800 |
| Imperial Ref. Co., Ardmore | 6,000 | 5,000 |
| Indiahoma Ref. Co., Okmulgee | 9,000 | SD |
| Illinois Oil Co., Cushing | 3,000 | 1,000 |
| Inland Ref. Co., Cushing | 3,000 | SD |
| Johnson Oil Ref. Co., Cleveland | 2,500 | 2,500 |
| Lawton Ref. Co., Lawton | 1,100 | SD |
| Local Ref. Co., Oklahoma City | 1,000 | 400 |
| Marland Ref. Co., Ponca City | 12,000 | 8,000 |
| Marland Ref. Co., Covington | 1,000 | SD |
| Maud Oil & Ref. Co., Maud | 400 | SD |
| Mecca Ref. Co., Allen | 1,600 | SD |
| Meridian Ref. Co., Okmulgee | 3,000 | SD |
| Meridian Ref. Co., Hominy | 1,000 | SD |
| Mid-Co Pet. Co., West Tulsa | 7,000 | SD |
| Navajo Ref. Co., Sapulpa | 1,500 | 300 |
| North American Ref. Co., Pemeta | 1,500 | SD |
| Nyanza Ref. Co., Wilson | 3,500 | 600 |
| Oil States Ref. Co., Enid | 2,500 | 500 |
| Pontotoc P. L. & Ref. Co., Allen | 1,500 | 400 |
| Omar Ref. Co., Garber | 2,500 | 1,000 |
| Oklahoma P. & R. Co., Muskogee | 2,500 | 1,500 |
| Pawhuska Ref. Co., Pawhuska | 1,000 | 4,000 |
| Waite Phillips Co., Okmulgee | 4,000 | 4,000 |
| P. & R. Corp., West Tulsa | 6,000 | 4,000 |
| Pure Oil Co., Ardmore | 7,000 | 2,300 |
| Pure Oil Co., Cushing | 6,500 | 5,500 |
| Pauline Ref. Co., Hampton | 1,200 | 500 |


LUCEY

"Wherever LUCEY There's Oil"

STEEL CASTINGS FOR REFINERIES

Open Hearth Process

Quick Delivery—Made in Houston

From One Pound to 8000 Pounds

Analysis of Every Heat Controlled in Our Own Laboratories, Insuring Uniform Quality.

Complete Pattern Shop, Machine Shops, Metallurgical and Engineering Staff at Your Disposal.

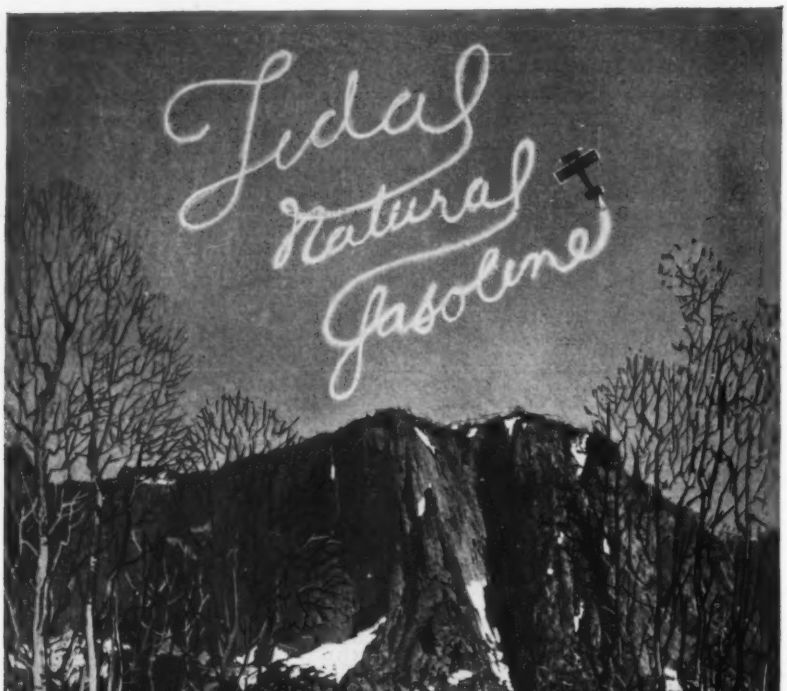
R. L. CULBERSON, Receiver

LUCEY MANUFACTURING CORPORATION OF TEXAS

Houston, Texas

Beaumont, Texas Shreveport, La. El Dorado, Ark. Mexia, Texas
Smackover, Ark. Corsicana, Texas Dallas, Texas

STEEL




## STABILIZED GASOLINE

After many months of investigation and experiment, we have adopted, in the manufacture of natural gasoline at our Burkburnett plants, a process which stabilizes the product and thus increases its value to refiners. Stabilized natural gasoline is different from the usual grades of natural gasoline in that its distillation recovery is much higher and its vapor tension much lower. In recent tests in which 80% of 53 gravity naphtha, 98.5% recovery, was blended with 20% of stabilized natural gasoline, we secured a product which has a recovery of 97.5%, meets all Navy specifications, and makes in every respect a motor fuel of high quality. We will soon be able to offer this stabilized product.

*Wire or Write*

**TIDAL REFINING COMPANY**
TIDAL BUILDING—TULSA, OKLAHOMA

*Subsidiary to*
Tide Water Oil Company, New York
Makers of Veedol Quality Lubricants *and* Tydol Economy Gasolene

| Plant and Location | Capacity | Now running |
|---|---|---|
| Powerine Oil Co., Billings | 500 | SD |
| Pierce Oil Corp., Sand Springs | 9,000 | 4,500 |
| P. & R. Corp., Blackwell | 2,500 | 1,500 |
| Pioneer Pet. Co., Guthrie | 2,500 | SD |
| Sheridan Ref. Co., Newkirk | 2,000 | SD |
| Rock Island Ref. & P. L. Co., Duncan | 1,200 | 1,000 |
| Santa Fe O. & R. Co., Ardmore | 5,000 | SD |
| Shaffer O. & R. Co., Cushing | 6,500 | 4,700 |
| Sapulpa Ref. Co., Sapulpa | 7,000 | SD |
| Southern Oil Corp., Yale | 6,000 | SD |
| Southland Oil Corp., Walters | 2,500 | SD |
| Sun Company, Yale | 4,500 | 2,000 |
| Southwestern Oil Corp., Enid | 1,800 | SD |
| Sinclair Ref. Co., Cushing | 5,500 | 5,000 |
| Sinclair Ref. Co., Muskogee | 2,000 | 500 |
| Sagimore Oil Corp., Grandfield | 2,000 | 1,500 |
| Texas Company, West Tulsa | 8,000 | 8,000 |
| Tide Ref. Co., Drumwright | 4,500 | 2,500 |
| Texas Pacific C. & O. Co., Wynnewood | 2,500 | 2,500 |
| Travis Senter Ref. Co., Comanche | 1,500 | 900 |
| Transcontinental Oil Co., Boynton | 2,500 | 1,200 |
| Transcontinental Oil Co., Bristow | 5,000 | 3,000 |
| Turley Ref. Co., Okla. City | 2,500 | SD |
| Union Oil & Ref. Co., Grandfield | 2,000 | SD |
| Wagoner Ref. Co., Wagoner | 500 | SD |
| Wilcox Ref. Co., Bristow | 500 | 400 |
| Yale Oil Corp., Yale | 1,200 | 1,000 |
| Total for Oklahoma | 353,900 | |
| **TEXAS** | | |
| American Oil Corp., Pioneer | 2,500 | 300 |
| American Ref. Co., Wichita Falls | 5,000 | 5,000 |
| H. E. Boner, Burkburnett | 700 | 200 |
| The Petroleum Corp., Electra | 2,000 | 800 |
| Buffalo Ref. Co., Sherman | 500 | 100 |
| Burk-Texas Ref. Co., Burkburnett | 1,200 | SD |
| Bear Ref. Co., Burkburnett | 1,200 | SD |
| Clayton O. & R. Co., Dallas | 3,500 | 2,000 |
| Crystal Pet. Co., Burkburnett | 1,000 | 300 |
| Eastland-Pioneer O.&R. Co., Cisco | 1,000 | SD |
| Empire Refs., Inc., Gainesville | 7,000 | 4,000 |
| General Refs., Inc., Abilene | 1,500 | SD |
| Gulf Ref. Co., Ft. Worth | 15,000 | 5,500 |
| Gorman Ref. Co., Gorman | 1,000 | SD |
| Griswold Ref. Co., Electra | 2,000 | 1,200 |
| Humble O. & R. Co., Burkburnett | 1,500 | 1,100 |
| Invincible Oil Corp., Ft. Worth | 5,000 | SD |
| Interstate Gasoline Co., Iowa Park | 2,000 | 800 |
| Iowa Park P. & R. Co., Iowa Park | 1,000 | 400 |
| Keystone Ranger Ref. Co. Wichita Falls | 2,000 | SD |
| Lone Star Ref. Co., Wichita Falls | 4,000 | 400 |
| Manhattan P. P. Co., Wichita Falls | 2,500 | SD |
| Megargel O. & R. Co., Megargel | 500 | 100 |
| Miller Pet. Co., Wichita Falls | 2,500 | 1,600 |
| Mexia O. & R. Co., Mexia | 600 | 100 |
| Magnolia Pet. Co., Ft. Worth | 12,500 | 5,000 |
| Noble O. & G. Co., Burkburnett | 5,000 | 3,000 |
| Nortex Ref. Co., Burkburnett | 2,000 | SD |
| North Texas Ref. Co., Greenville | 1,000 | SD |
| Owenwood Oil Corp., Burkburnett | 2,000 | SD |
| Oriental Ref. Co., Dallas | 5,000 | 400 |
| Oddessa Ref. Co., Ranger | 1,000 | SD |
| Orient Pet. Co., Wichita Falls | 2,000 | 400 |
| Pierce Oil Corp., Fort Worth | 10,000 | SD |
| Panhandle Ref. Co., Wichita Falls | 4,500 | 2,500 |
| Associated P.&R. Corp., Ft. Worth | 2,000 | SD |
| Primrose Ref. Co., Wichita Falls | 1,500 | 900 |
| Interstate Ref. Co., Ranger | 2,500 | SD |
| Haggeman Ref. Co., Tiffin | 2,000 | 200 |
| Star Ref. Co., Ft. Worth | 1,500 | 200 |
| State Ref. Co., Dallas | 1,000 | 200 |
| Sunshine State Ref. Co., Wichita Falls | 2,500 | 1,400 |
| Tidal Western R. Co., Burkburnett | 3,000 | 1,400 |
| Texas Company, Dallas | 15,000 | 8,000 |
| Texas Prod. Ref. Co., Waxahachie | 2,000 | SD |
| Texhoma O. & R. Co., Wichita Falls | 4,500 | 3,500 |
| Tiger O. & R. Co., Breckenridge | 1,500 | SD |
| Transcontinental O. Co., Ft. Worth | 5,000 | 1,200 |
| Travis Ref. Co., Burkburnett | 1,000 | SD |
| Great Texas Ref. Co., De Leon | 700 | SD |
| Uniform Pet. Co., Burkburnett | 4,000 | SD |
| Virginia Ref. Co., Dublin | 4,000 | SD |
| Victor Ref. Co., Burkburnett | 2,000 | SD |
| Wagoner Ref. Co., Electra | 2,200 | 2,800 |
| Walker Cons. Ref. Co., Iowa Park | 2,500 | SD |
| White Eagle O. & R. Co., Ft. Worth | 5,000 | 3,500 |
| Waco Ref. Co., Waco | 5,000 | SD |
| Wortham Ref. Co., Wortham | 400 | SD |
| World Ref. Co., Bridgeport | 800 | SD |
| Total for Texas | 178,200 | |

# REFINERY AND GASOLINE PLANT ACTIVITIES

## Natural Gasoline Output in North Texas Shows Gain With New Plants in Operation

**Fort Worth, Texas.**—Shipments of natural gasoline from the various manufacturing centers in North and Central West Texas maintained an average of 15,487,129 gallons per month during the year 1923, with a substantial gain being shown during the last half of the year as result of a number of new plants placed in operation in the Central West Texas fields. Shipments made during 1923 by the various major companies and independent owners of natural gasoline plants amounted to 185,845,548 gallons, and were widely distributed throughout the states lying east of the Rocky Mountains, especially to large refineries along the Gulf Coast and Atlantic seaboard, where the product is used extensively for blending into motor fuels.

December led all the months in the year 1923 in shipments of natural gasoline, with a total of 18,173,778 gallons, while July ranked second with 17,289,216 gallons. The heavy shipments during both of these months was largely due to conditions prevailing in the gasoline market, and not to any sudden increase in production. The big movement of natural gasoline during July was made at a sacrifice in prices by the plant owners, who were caught with all storage filled as result of the failure of an anticipated early summer demand for natural gasoline to materialize during May and June. The natural gasoline market sagged further towards the close of the summer motoring season in both price and demand, and did not offer any encouragement for better prices until late in November and early December. With the arrival of the first indications of a turn for the better in the natural gasoline market, many of the plant owners began piling up stocks for higher prices, and were partially rewarded towards the close of December, when the market began its long expected upward swing. It was the movement of a quantity of this storage gasoline during December along with the completion of several new plants in Central West Texas that made it possible for the last month in 1923 to establish a new high record on natural gasoline shipments from Texas.

New plants under construction and increased capacity being added to old plants already in operation give promise of utilizing virtually all the desirable gas production in the North and Central West Texas fields, but the growth of the natural gasoline industry in Texas is not expected to be checked when present construction work is completed as additional gas is almost certain to be made available by the renewed field operations. Drilling has been resumed since the first of the year in all the fields furnishing gas for the natural gasoline plants, and since most of these tests are in proven, or semi-proven territory a substantial increase in gas production is expected in the Central West Texas fields within the next three months. The return of the $2 price on high gravity crude is having a stimulating effect on wildcat operations, thereby adding to the hopes of the plant owners of new gas producing areas being uncovered and making it possible for them to continue to enlarge their activities.

The return of favorable prices and demand for natural gasoline during the past six weeks has replaced the natural gasoline industry on a profitable basis again, and has fostered a desire among the plant owners to enlarge their scope of operations to reap the full benefits of a favorable gasoline market expected throughout the coming summer months. Advertising for gas contracts in newspapers enjoying wide distribution in Central West Texas oil fields is reported to have been resorted to recently by one of the natural gasoline manufacturers, with hopes of picking up a few contracts that had been overlooked by gas scouts, while others have recently offered bonuses for gas in the form of larger royalty interests to attract contracts from owners of gas wells. Quite frequently plant owners contract for gas production on drilling tests long before same are in striking distance of the producing horizon to avoid the uncertainty of being favored with a contract if the test proved a good producer of rich gas.

Shipments of natural gasoline from the various manufacturing centers in Texas during November and December, along with totals by districts for 1923, follow:

| Field— | November | December | 1923 Total |
|---|---|---|---|
| Stephens County | 111,695 | 118,884 | 1,126,337 |
| Ranger - Eastland-Poineer | 92,566 | 113,295 | 1,125,011 |
| Burkburnett | 67,590 | 67,135 | 922,446 |
| Desdemona - Gormon | 82,340 | 86,604 | 856,658 |
| Electra | 20,070 | 21,086 | 190,855 |
| Young County | 10,010 | 11,365 | 86,446 |
| Petrolia | 4,800 | 4,840 | 68,066 |
| Ibex - Shackelford County | 11,405 | 8,520 | 47,900 |
| Brown County | 195 | 980 | 1,175 |
| Totals in barrels 42 gals.) | 400,671 | 432,709 | 4,424,894 |

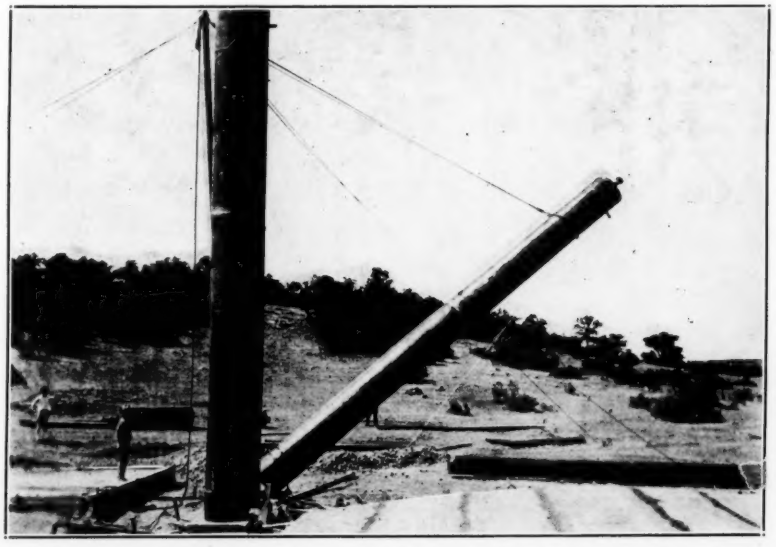
Note—Shipments made during the first 10 months in 1923 were published by districts in the December issue of The REFINER AND NATURAL GASOLINE MANUFACTURER.

## Gasoline Engineering Concern Is Organized

**Tulsa, Oklahoma, Jan. 31.**—Foster & Bowles Corporation is the name of a new company recently incorporated here. This company is the outgrowth of work by Dean E. Foster, oil engineer.

Several years ago Mr. Foster decided to concentrate his efforts in the field of gasoline engineering. The "Foster Baffle," invented and manufactured by him, is in use in many gasoline plants in the Mid-Continent, the Rocky Mountain area and on the Pacific Coast.

Associated with Mr. Foster in his company are Mr. Blair, who has had considerable experience in the gasoline industry, and Mr. Bowles, analyst and statistician. The new company is to specialize in consulting work concerning all branches of the oil and gasoline industry.



Erecting gasoline towers for Benwick Gasoline Company, Eastland, Texos.

## Magnolia to Further Increase Carbon Plant

**Breckenridge, Texas.**—Another unit consisting of 30 burning houses is to be added immediately to the carbon black plant of the Magnolia Petroleum Company on the Jesse R. Smith lease, located south of Breckenridge, Stephens County. This plant was placed in operation last fall, and is credited with a daily output of carbon black averaging 7600 pounds, or a recovery of more than a pound per thousand cubic feet of gas. It is burning residue gas from a nearby natural gasoline plant operated by the Magnolia Petroleum Company. The production of this carbon black plant is being stored, owing to the surplus of stocks already on the market and comparatively low prices prevailing.

## Magnolia Starts Work on Second Desdemona Plant

**Desdemona, Texas.** — Construction work has been started by the Magnolia Petroleum Company on a second natural gasoline manufacturing plant in the Desdemona-Gorman field in Eastland County. This plant is being erected on the Wright-Eidson lease in the northwest corner of the field, and will make use of the compression process. It will have two units, with a capacity of 1,000,000 cubic feet of gas daily, and will be known as plant No. 8.

**Duncan, Okla.**—The absorption plant of the Oklahoma Natural Gas Company in the Chickasha field in Grady County, Oklahoma, is to be moved to a location four and a half miles east of Chickasha.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COMPRESSION and Absorption Gasoline

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*Exchange National Bank Building*

TULSA :—: :—: OKLAHOMA


## Fire Destroys Carbon Black Held in Storage

**Breckenridge, Texas.**—Stocks of carbon black held in storage by the Coltexo Corporation at its carbon black plant on the J. W. Parks lease, located in Southern Stephens County, caught fire from an undetermined source late in January and destroyed one warehouse and an adjoining building. The fire burned for nearly a week before consuming the stocks of black in the warehouse. The carbon black was stored in paper sacks of 10 pounds each, and the fire was well underway when first discovered. When once aflre, carbon black is very difficult to save, as it burns with an intense heat, and the use of water in combatting the fire makes a total loss to the entire stocks.

**Casper, Wyo.**—The Mutual Oil Company's natural gasoline plant in the Kock River field in this state is to be started up again, it having been shut down during the period of low prices for gasoline.

**Ardmore, Okla.**—The Barco Gasoline Company, a subsidiary of Chestnut and Smith Corporation, has purchased the natural gasoline plant of the Hamon estate at Wirt in Carter County, Oklahoma.

## Gulf Making Improvements To Port Arthur Refinery

**Houston, Texas.**—Extensive enlargement work is being done by the Gulf Refining Company at its plant located at Port Arthur, Texas. A number of 20,000 barrel refined oil storage tanks are being put up and 30 process stills are being added to the refinery. Improvement work last year amounted to an expenditure of nearly eight and one-half million dollars. About 60 stills were put in.

### MOVES OFFICES

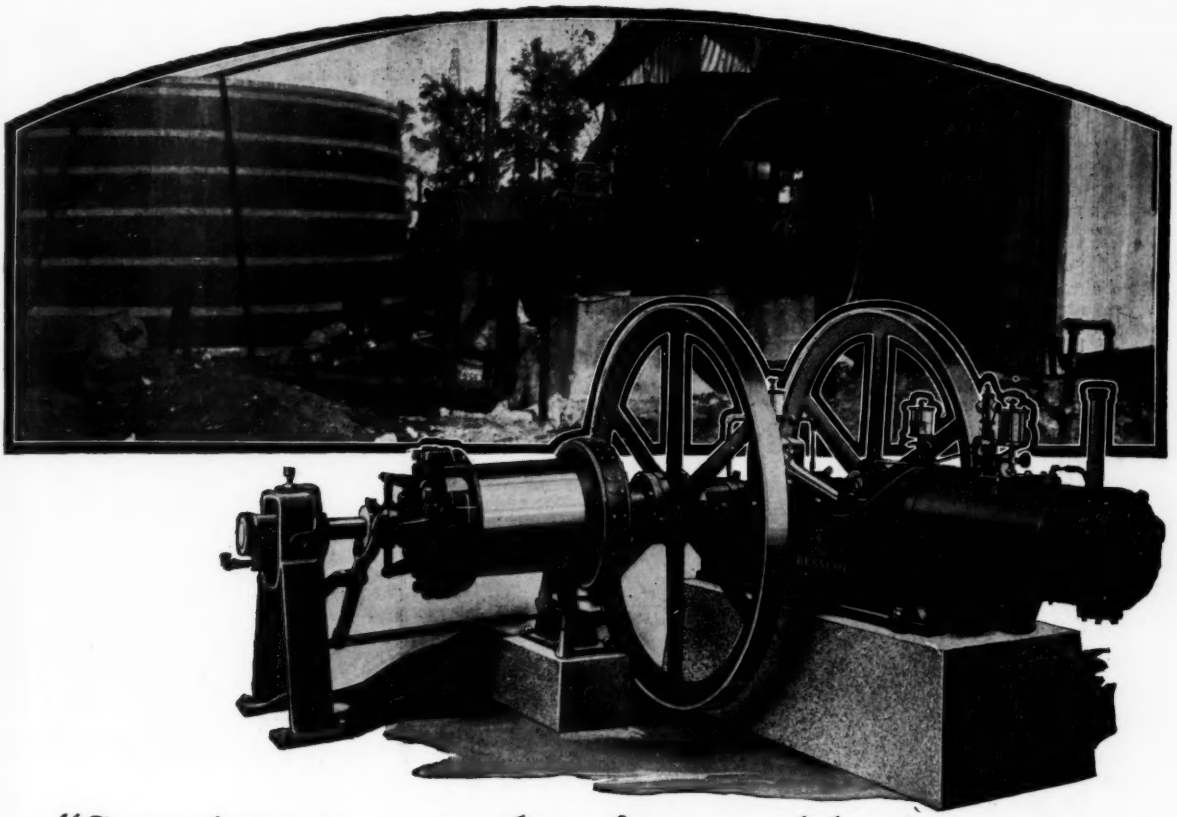
**Tulsa, Okla.**—Offices of the Imperial Refining Company and the affiliated Imperial Oil Marketing and Kettle Creek Refining Companies, have been moved to the ninth floor of the Atlas Life Building. These companies were formerly located in the Kennedy Building.

**Coffeyville, Kans.**—Eugene H. Angert, president of the Kansas Oil Refining Company and the Alluwe Oil Company, denies a report that the companies are to merge with the Diamond Refining Company of Kansas City and Tulsa.

**Bartlesville, Okla.**—Phillips Petroleum Company recently has completed four compression gasoline plants in Young County, Texas, and contemplates the erection of more.

**Fort Smith, Ark.**—The Arkansas refinery here is to resume operations, according to Tulsa interests who have taken charge.

**Denver, Colo.**—The new eight inch welded gas line of the Midwest Refining to handle residue gas from the Salt Creek gasoline plant to refineries at Casper has been put in operation.



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# BESSEMER

BESSEMER OIL FIELD ENGINES – COMPRESSORS VACUUM PUMPS – ROLLER PUMPING POWERS

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# Losses From Uncondensed Still Vapors

## More uncondensed vapors lost in cracking plants than same capacity straight run refineries report says

METHODS by which enormous volumes of gasoline now lost in ordinary petroleum refining processes may be recovered by the condensation of still vapors are outlined in detail by D. B. Dow, associate organic chemist, Department of the Interior, in Technical Paper 310, just issued by the Bureau of Mines. At thirteen refineries from which data were collected 128,651 gallons of gasoline, representing an average increased recovery of nearly half a gallon of gasoline per barrel of crude oil, were being recovered daily from uncondensed vapors. The figures represent the increased conversion into gasoline of 1.05 per cent of the crude oil charged, which would otherwise have been lost.

Losses of gasoline from uncondensed still vapors will tend to become larger in the future, the Bureau of Mines points out, because the growing tendency to eliminate evaporation losses in handling crude oil in the field will result in refineries receiving crudes containing much lighter and more volatile fractions. The magnitude of the losses resulting from non-condensation of still vapors has been realized by only a small proportion of the refineries and comparatively few plants have installed recovery systems.

Other conditions being equal, more uncondensed vapor will be lost in a refinery which has increased the gasoline yield from crude by installing cracking stills than in a skimming plant obtaining the gasoline naturally present in the crude.

The loss in uncondensed vapors will be larger from a crude yielding high-volatile gasoline than from a crude yielding low-volatile gasoline. Losses due to uncondensed vapors are higher in summer than in winter.

The higher the temperature of the stream the greater is the amount of uncondensed vapor. Stream temperature depends directly on the temperature of the cooling water and the coil surface. When stream temperatures exceed 85° F. the volumes of uncondensed vapors become increasingly large. Experimental and plant data show the effects of varying conditions of temperature.

In collecting the vapors at a recovery plant, a small vacuum is held by the intake of the compressor or by an exhauster on run down lines where the vapors are trapped off by goosenecks. This gas passed through traps that remove any condensate carried in the lines.

If the sulphur content of the gas is high, the sulphur must be removed in a special unit, either by scrubbing with a solution of caustic soda or by contact with oxides of iron or lime suspended in water.

Several different processes can be used to recover gasoline from still vapors: Compression is the more common process. The gas is compressed to a high pressure and cooled. Gasoline vapors are condensed and collected, but any permanent gas present is not materially affected. In the absorption process the gas is passed through a distillate of lower Baume gravity that absorbs the gasoline. When naphtha is used as the absorbent the naphtha is raised in Baume gravity to the point where it may be marketed as gasoline. When a heavy gas-oil distillate is used, the gasoline is recovered from the gas oil by distillation. A combination of the two methods is used when the gas after compression is passed through absorption towers.

Copies of Technical Paper 310 may be obtained from the Department of the Interior, Bureau of Mines, Washington, D. C.

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**San Antonio, Texas.**—Schimmel & Company of Fort Worth are reported to be contemplating the erection of a natural gasoline manufacturing plant on its producing properties in the Somerset field. Although the gas production in this field is very limited, the gas from some of the wells is credited with having a yield of about two gallons per 1000 cubic feet.

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GRAVITY.....Not below 72° Be.
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RECOVERY.....Not less than 90%

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GRAVITY.....Not below 76° Be.
Not above 82° Be.
E. P.....Not over 375° F.
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## grade "c"

GRAVITY.....Not below 80° Be.
Not above 88° Be.
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RECOVERY.....Not less than 78%

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GRAVITY.....Not below 88° Be.
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Not above 62° Be.
E. P.....Not over 437° F.
RECOVERY.....Not less than 91%

## grade "2"

GRAVITY.....Not below 58° Be.
Not above 62° Be.
E. P.....Not over 450° F.
RECOVERY.....Not less than 90%

## grade "3"

GRAVITY.....Not below 64° Be.
Not above 66° Be.
E. P.....Not over 440° F.
RECOVERY.....Not less than 88%

## grade "4"

GRAVITY.....Not under 66° Be.
Not over 70° Be.
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## Floating Tank Deck Is Latest Columbian Tank

**Kansas City, Mo.**—A floating tank deck that is a permanent structure and prevents oil tank fires and reduces evaporation is being manufactured by the Columbian Steel Tank Company of Kansas City and marketed under the trade name of the Safety Floating Tank Deck. The deck was invented by F. W. Kueffer, who was accidentally killed November 28 at a railroad crossing west of Ottawa, Kansas.

Briefly described, according to the manufacturers, the floating deck is a steel disc—a duplicate of the tank bottom except that is is from 12 to 18 inches smaller in diameter than the diameter of the tank. The disc is assembled on a sub-structure, the girders of which radiate at all angles from a center collar or sleeve around a steel pole anchored at the bottom center of the tank and centered by guy cables to the top edge of the tank. A second set of cables from the top of the collar to the deck, midway of its radius, acts as additional reinforcement to the substructure.

The intervening space between the tank wall and floating deck is filled with a ring of patented steel baskets containing gravel, from the weight of which the ring of baskets fit snugly against the tank wall. These patented baskets are flexible and are, in effect, a hinged continuation of the oil tight steel deck, extending above the level of the deck and below the oil level, insuring ample gravel capacity to prevent any circulation of air.

## Combination Plant to Be Built at Monroe

**Monroe, La.**—The Chester Carbon Company has announced that construction work will be started early in February on its combination carbon black and natural gasoline manufacturing plant in the Monroe field. The plant is to have a daily capacity of 10,000,000 cubic feet of gas, and will represent an investment of approximately $250,000 when completed. It was scheduled for erection last fall, but work was postponed owing to conditions of the carbon black and natural gasoline market.

**Baltimore, Md.**—The English company of Silica Gel Corporation, capitalized at $1,500,000, is prohibited from using the process in refining petroleum products, but is free to use it for all other purposes.

**Casper, Wyo.**—Operations on the refinery of the White Eagle Oil and Refining Company near here are being started up, tests having been made the latter part of January on several stills. Salt Creek crude will be run.

**Okmulgee, Okla.**—The plant here of the Allied Refining Company is to be improved and enlarged during 1924 by the addition of a lubricating plant to cost from $125,000 to $150,000.

**Oklahoma City, Okla.**—The Sayre Refining Company, a new $100,000 concern, has purchased an abandoned refinery at Chickasha, Oklahoma, and intends to modernize it.

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**Gasoline Condenser**
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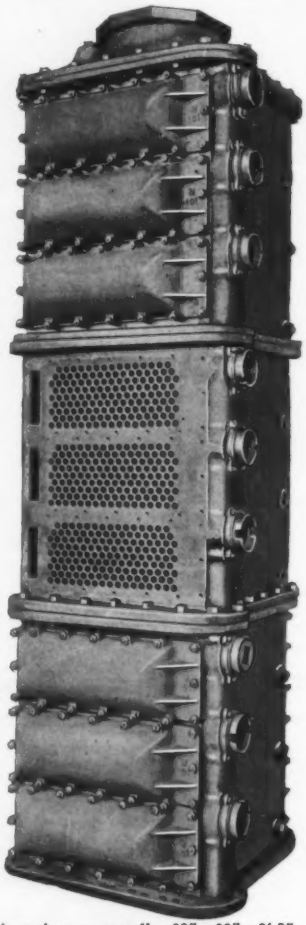

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## Hassan Goes to Europe For Sinclair Company

**Dallas, Texas.**—Harry A. Hassan, Jr., who established the Dallas buying office for the Union Petroleum Company in 1920 and continued to have charge of same when the Sinclair Refining Company officially absorbed the former company last year, has been assigned to the duties of European representative for the Sinclair Refining Company and will depart late next month to take charge of Sinclair's foreign headquarters at Paris, France. Hassan enjoys a wide acquaintance among the refiners throughout the Southwest, especially in Texas, Louisiana and Arkansas, which constitutes his allotted buying territory, and holds the record of having been the largest buyer of refined products in these three states since 1920, with the bulk of the products destined for export delivery.

Although still a comparatively young man, Hassan entered the services of the Union Petroleum Company in 1914 at Philadelphia, Pennsylvania, where he was raised, and worked in the retail sales department until the outbreak of war in 1917. Volunteering his services to Uncle Sam, he found himself overseas within a few months after war was declared, and for the fighting that he took part in during the 37 months spent overseas he now has a wounded soldier's silver button, as well as a Croix de Guerre from the French government. Hassan held the military rank of a captain toward the end of the war, and was discharged as a major. Shortly after returning to the States and being discharged, Hassan was sent to Dallas early in 1920 by the Union Petroleum Company to establish a buying office, and it is the work that he has performed for his company during the past four years at this office that has earned for him the position of European representative.

W. A. Tracey of the export department of the Sinclair Refining Company at New York City has arrived in Dallas to familiarize himself with market conditions and get acquainted with the refiners before relieving Hassan. Tracey began working for the Union Petroleum Company in 1913, and during his long period of services has obtained an intimate knowledge of the marketing situation, both domestic and foreign.

## Fire Does Little Damage To Stephens County Plant

**Breckenridge, Texas.**—Fire originating from a defective fitting in the natural gasoline plant of the National Gasoline Company on the Walker-Caldwell lease near Breckenridge during the second week in January caused a small amount of damage to the plant and painful burns to two of the employes. The damages were repaired as quickly as possible, and operations were resumed within three days after the accident.

**Trainer, Pa.**—The new refinery of Sinclair Consolidated being erected here is expected to be completed this spring.

**Casper, Wyo.**—The Glenrock refinery of the Mutual Oil Company is starting up operations again and plans are to increase to capacity.

## Pipe Still Erected to Handle Mirando Crude

**Mirando City, Texas.**—A small pipe still has been erected by the Magnolia Petroleum Company near its crude tank farm in the Schott pool section of Webb County to top the high gravity oil obtained from the 1900-foot pay on some of its leases. Only one run is made on this crude, and the residue is diverted to field storage tanks along with the lower grade of crude in the field, while the gasoline is shipped out in tank cars. Magnolia has not moved any appreciable amount of the crude produced and brought in this field, and during the past year has accumulated about five 55,000-barrel tanks of crude.

## Pierce Starts Plant After Year Shut Down

**Texas City, Texas.**—After being idle for more than a year, the 8000 barrel daily capacity refinery of the Pierce Oil Corporation has resumed operations. Workmen have been engaged in overhauling the stills and other refinery equipment for the past month, while crude for the plant is being purchased on the Coast. No attempt has been made to start up Pierce's 10,000 barrel daily capacity refinery located at Fort Worth.

## Texhoma Getting Ready To Run Second Plant

**Wichita Falls, Texas.**—The Texhoma Oil & Refining Company is reported to be making preparations to start operating early in February the 3000 barrel daily capacity skimming plant of the Walker Consolidated Petroleum Company at Iowa Park. This plant has been inactive for more than a year, and is located on Texhoma's pipe line carrying crude from the Electra and Hirschi fields to its refinery at Wichita Falls.

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And the cost of cracking by the Dubbs Process is no more than the average cost of skimming

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# ÷ REFINERY SUPPLIES ÷

**Refiners' Supplies**

| | Jan. 28 |
|---|---|
| Soda Ash light 58% .....cwt. | $1.38–1.50 |
| Silicate of Soda 60 deg, bbls....cwt | 1.70 |
| Sal Soda wks .....cwt. | 1.10–1.30 |
| Caustic Soda 76%.....cwt. | 3.10–3.17 |
| Chloride of Lime solid.....cwt. | ... 1.80 |
| Sulphuric Acid 60 deg. tank cars f .o. b. shipping point....per ton | 11.00–12.00 |

**Benzol—**

| | | |
|---|---|---|
| Pure Water White .....Tanks....gal | .23 | —.28 |
| Drum...gal. | .28 | —.33 |
| 90% . .....Tanks...gal | .21 | —.26 |
| Drums...gal | .26 | —.31 |

**Jobbers' Supplies**

**Vegetable Oils—**

| | |
|---|---|
| *Linseed, carloads Spot.....gal. | —.92 |
| February . .....gal. | —.92 |
| Less carload Spot .....gal. | —.95 |
| 5 bbls. or less Spot.....gal. | .98–.97 |
| Boiled, tank Spot .....gal. | —.88 |
| Boiled, carloads Spot .....gal. | —.94 |
| Soya Bean Spot, Tanks.....lb. | —.10½ |

**Animal Oils—**

| | |
|---|---|
| English Degras . .....lb. | $–.04¾ |
| Domestic Degras, bbls., carloads....lb. | –.03¾ |
| Horse . .....lb. | .07¾–.08 |

**Oleic Acids—**

| | |
|---|---|
| Dist . .....lb. | .08¼ |
| Saponified . .....lb. | .08¼ |

**Lard Oils—**

| | |
|---|---|
| Prime | |
| Winter | |
| Strained.....2 to 4½ ffa. 40/45c. t. lb. | 15¼ |
| Extra | |
| Winter | |
| Strained.....2 to 4½ ffa. 40/45c. t. lb. | 13¼ |
| Extra.....4 to 5 ffa. 40/45c. t. lb. | 12¼ |
| Extra No. 1....7 to 10 ffa. 40/50c. t. lb. | 11½ |
| Extra No. 1....15 to 18 ffa. 40/50c t. lb. | 11 |
| No. 2.....22 to 23 ffa. 40/45c t. lb | 10½ |
| Prime Edible Tallow under 1⅞ ffa. 40/45c t. N. Y.....lb. | —.09½ |
| Tallow acidless .....lb. | —.11½ |
| Lard Stearine .....lb. | —.15 |
| Oleo Stearine .....lb. | —.10 |

**Neatsfoot Oil—**

| | |
|---|---|
| Pure . .....bbls.-lb. | —.14¼ |
| Extra. .....bbls.-lb. | —.11½ |
| No. 1 .....bbls.-lb | —.11 |
| Cold pressed .....lb. | —.17½ |

**Fish Oils—**

| | |
|---|---|
| Menhaden Oil | |
| Light pressed . .....gal. | $ –.65 |
| White . . .....gal. | –.70 |
| Yellow bleached . .....gal. | –.68 |
| *Herring, tankcars coast.....gal. | –.50 |
| Whale, extra winter bleached ....gal. | –.81 |
| Seal . ..... | Nominal |

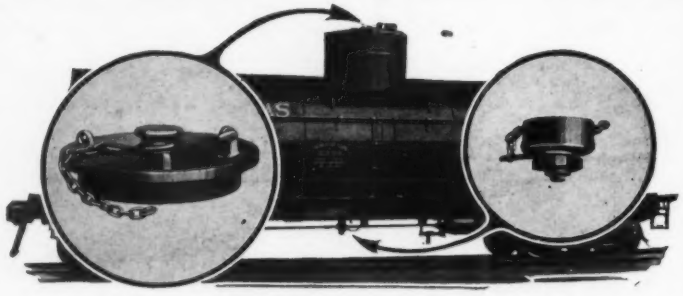
**Naval Stores—**

| | |
|---|---|
| Tupentine, N. Y.....gal. | $1.03 |
| †Turpentine . .....gal. | .96½ |
| Rosin B. N. Y.....bbl. | 5.80 |
| Rosin F. N. Y.....bbl. | 5.90 |
| Rosin B.† .....bbl. | 4.60 |
| Rosin F.† .....bbl. | 4.60 |
| Rosin Oil 1st run.....gal. | .42 |
| Rosin Oil 2nd run.....gal. | .47 |

**Pine Tar—**

| | |
|---|---|
| Kiln Burnt . .....Bbl. | 11.00 |
| Retort . .....Bbl. | 11.00 |

*Nominal
†Savannah, Ga., market.

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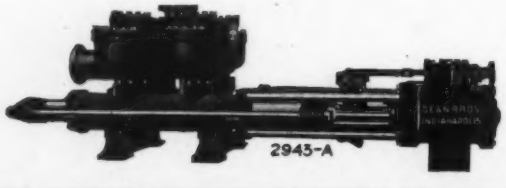




## Calorizing Company Has Catalog Out for Refiners

"Preventable Losses in Oil Refining" is the title of a booklet recently published by the Calorizing Company, Oliver Building, Pittsburgh, Pennsylvania.

This booklet gives descriptions and pictures of calorized tubes in use about refineries. The following sub-titles indicate the contents of the booklet: Losses from oxidation; coke deposit; carburization, corrosion; buckling, swelling; leaky tube ends and erosion; shrinkage; cleaning; tube cleaners; key caps; oil burners; recuperators; tubes; calorizing and human life; condensers; and miscellaneous applications of calorized material.

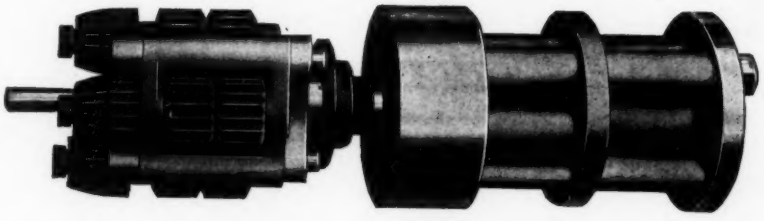
# Clean Your Cracking Still Tubes Quickly and Safely

## *It Will Mean—*

(1) Less idle time for the stills
Greater Production

(2) No cutting into or damaging of the tube wall—Long Life to the Tubes

This can be brought about through the use of



## Roto Tube Cleaners

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Let us give you the benefit of our wide experience in the cleaning of cracking stills. Our catalog contains some valuable information—write for your copy.

**The Roto Company**
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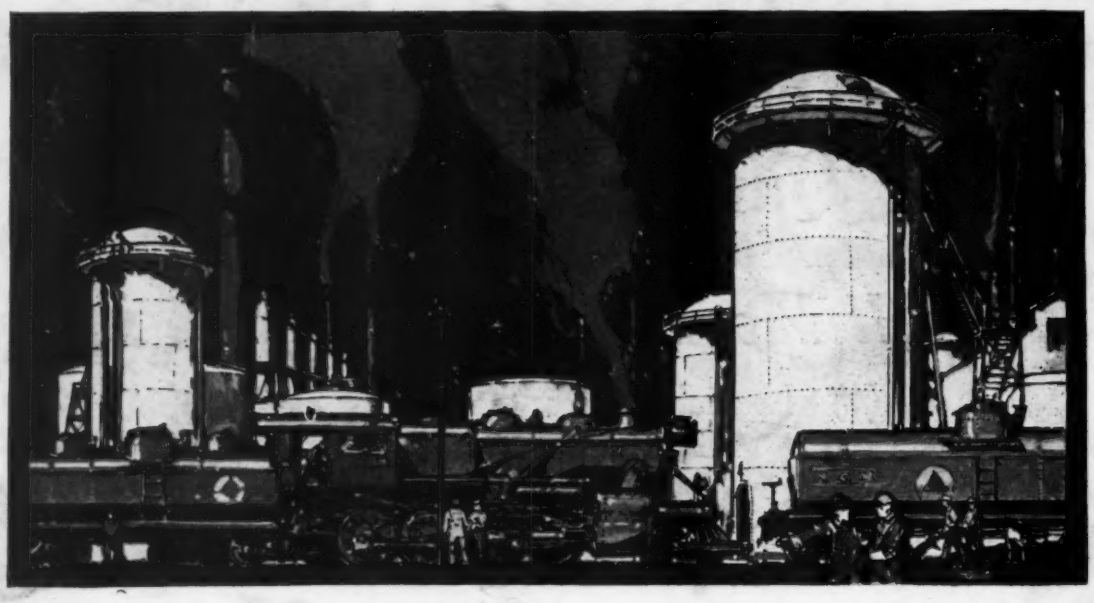

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